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VOLUME 6, No. 1 JANUARY 1954

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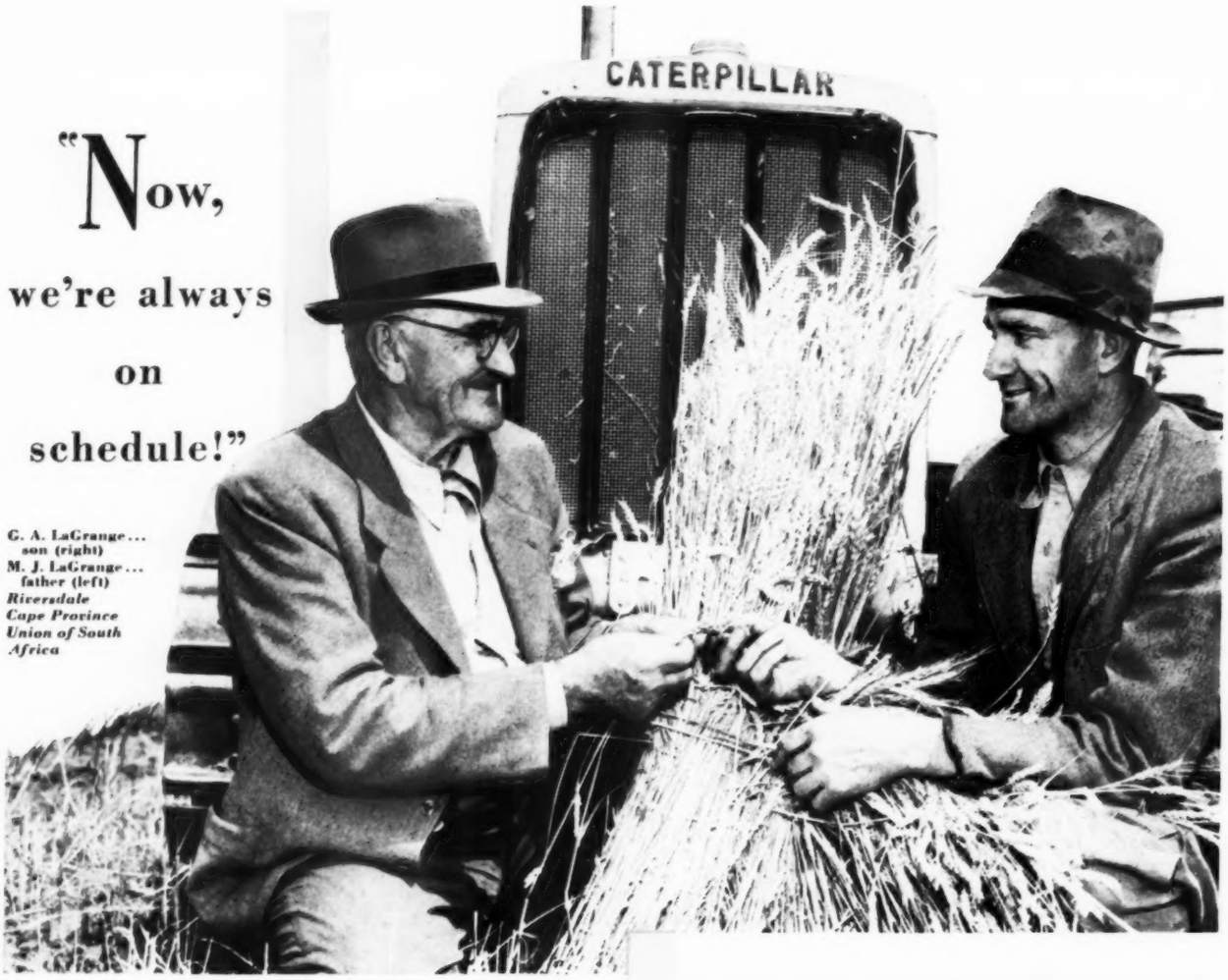

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CONTENTS

EDITORIAL COMMENT:
The New Year; International Investment in Underdeveloped Areas; Obstacles to Development; Fly Resistance; Anno Domini; Land Utilisation in Britain; Commodity Prices; Pesticide Tolerances; Indian Sugar Problems; British Cotton Purchase Policy 1

World Agricultural Production in 1952-53 5

Developments in the Belgian Congo with Special Reference to Cocoa—*D. H. Urquhart*, B.SC. ... 10

Land Reclamation Schemes in India—*S. Ramanath* 13

Control of the Potato Root Eelworm—*Dr. John Grainger* 17

The Smithfield and Agricultural Machinery Show ... 23

Pest Disinfestation Work in the Port of London—*W. A. Potter* 27

Soil Conditioners—*C. L. W. Swanson* 31

South African Crop Prospects 34

Research Developments: Cereal Yields in Eastern England 36

New Books 37

Reports and Publications 39

Farm Machinery 40

World Crop Reports 41

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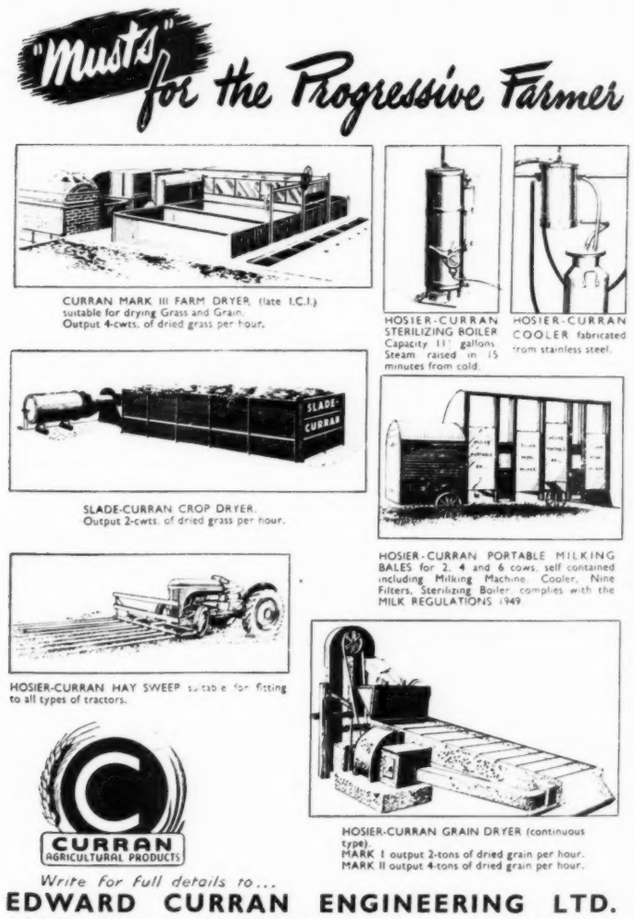
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Editorial Comment

The New Year

AT this season the thoughts of all take a kindlier tinge and the old wish, peace on earth and goodwill towards men, comes as a message which through the ages has gained in intensity and urgency. After two world wars and in the uneasy peace which has followed them national rivalries, conflicting political ideologies and unsolved economic and sociological problems have produced a condition of affairs which for explosive potentialities and the threat of dire consequences exceeds anything ever encountered in the history of humanity. The United Nations Organisation, of which so much was hoped at the outset, has so far been notably unsuccessful in resolving the major ideological differences which separate nation from nation, although none would gainsay that through some of its agencies it has to its credit some signal achievements in other less spectacular fields. In agriculture, a marked advance has been achieved since, for the first time since the war, world production of food during 1953 is reported by FAO to have increased at a rate which exceeded the rate of increase of world populations. This is indeed a matter for tempered satisfaction, although much of this increase has occurred in dollar areas and lack of exchange has precluded its becoming freely available in the area of greatest food deficiency, notably the Far East.

Nevertheless, it is a hopeful sign and all will unite in the wish that in the coming year further advances may be made toward the solution of world problems in agricultural production which play so large a part in securing that most desirable of all conditions, permanent world peace. To all its readers WORLD CROPS takes the opportunity of wishing them peace and prosperity in 1954.

International investment in underdeveloped areas

ATTENTION is being focused increasingly on the undeveloped and underdeveloped areas of the world and on their peoples. The governments of the more progressive and developed regions have devoted much effort and thought to the possibilities of the regions as sources of the additional food and raw materials, the need for which becomes more and more clamant as populations increase. At the same time, there is wide appreciation that the populations of most of these lands are badly undernourished, while their living standards are a long way below what can be considered adequate, judged by ordinary Western standards.

Efforts to improve matters have been undertaken by many countries of Western Europe of their own resources, but the great international association of the United Nations and the organisations ancillary to it like FAO, WHO and OEEC are now playing an important role and acting as correlating and co-ordinating agents for the efforts of individual nations.

Recently, FAO has published in its monthly bulletin of economics and statistics a critical examination of the existing total investments in these underdeveloped regions and estimates of the total financial requirements if the needs are to be adequately met. According to this calculation, FAO places the total investment needs of the world at $4,000 million a year, while the need for international investment is placed at $2,000 million a year if the national income in these areas is to be raised *per caput* annually by 2%. It has also been estimated that a similar amount is required to raise agricultural output by 1% to 2% above population growth.

Actually, international investment in agriculture in underdeveloped regions has been averaging over $200 million a year from 1949 down to the past year. It will be seen how very far the actual provision of finance falls short of requirements, being only about one-tenth of the estimated amount required to achieve the objectives internationally agreed to be desirable. FAO has prepared the following table showing the amounts of foreign agricultural capital at present available and the estimated requirements of different regions of the world, which illustrates the foregoing remarks:

Item	*Latin America*	*Africa*	*Far East*	*Near East*	*Total*
			Million U.S. dollars		
Estimated flow* ..	60	60	60	35	215
Estimated requirements	500	250	1,050	200	2,000

*Annual averages, 1949-52, rounded off

It must be realised, however, that these estimates of needs as well as the actual flow of funds are subject to a considerable margin of error, while most of the undeveloped countries are at present not in a position to utilise funds of the order indicated for investment needs even should they by some miracle become available.

Obstacles to development

AMONG the obstacles must be reckoned lack of skilled manpower, inadequate administrative provision, lack of properly thought-out domestic development policies and unstable governments. There is little doubt that the increasing reluctance of private capital to invest in new developments in the regions is largely influenced by all these factors, especially the last two. There has been a tendency for underdeveloped countries in the tropical regions to clamour for self-government. Instances are not lacking, however, of such political agitations begetting undesirable results, especially if they are too easily acceded to; of this the recent disturbances in British Guiana are a case in point, since there the too-easy grant of a too-liberal constitution has been the signal for the outbreak of an epidemic of sabotage and lawlessness under the influence of exponents of a political creed which fondly believes that violence can pave the way for a new and better order of things.

Unless and until it is realised, therefore, that the flow of capital to underdeveloped territories, whether from public or private sources, depends on adequate guarantees that it will be properly used under a stable and responsible government, it is useless for the people of underdeveloped regions to hope to raise the living standards of their peoples, since the ability to do this depends on their obtaining capital for development from outside sources.

Fly resistance

THE ubiquitous housefly has triumphed over DDT in no indefinite manner. It is still vulnerable *if* DDT has not been consistently used; it ceases to be vulnerable, however, when DDT is used for regular control, for resistant generations are all too speedily bred. The more favourable the climate for fly breeding, the more rapidly resistance appears; thus in the United States pronounced resistance was first observed in Southern California, where the fly can breed for almost 12 months per year. What is true of DDT seems fundamentally true of other chlorinated hydrocarbon insecticides. In Denmark, the use of DDT was so thoroughly and systematically developed in dairy farms that general immunity has now established itself. Danish flies can smile at DDT; efficiency in application has met with the fullest swing of the reactionary pendulum.

In the United States, research has failed to find a strain of flies that can resist parathion, but the toxic hazards associated with this insecticide prevent its general use for fly control on farms or domestically. Denmark seems to have been bolder, for in a recent communication (*Nature*, **172,** 758, 1953) it is reported that the problems involved in using parathion have been quite easily overcome. Strips of gauze, the type used for bandages, are impregnated with parathion solution and hung in farm buildings; even after six months' exposure to warm temperatures these strips still give 100% kills. This idea, first developed at the Springforbi Pest Infestation Laboratory, has been taken up commercially; strips of several lengths and widths are manufactured. In 1952, these impregnated strips were used on some 20,000 farms; in 1953, it is estimated that they were used on 100,000 farms. Failures to give complete control over common flies have been scarce; accidents caused by the use of parathion have not even been singly reported. Denmark would seem to have succeeded where others fear to tread.

In America, meanwhile, there are a few signs of greater optimism. Resistance is believed to have declined during 1953, but this may be due, simply enough, to a lessened use of DDT in acknowledgment of its defeat by the housefly. Signs of slightly decreased resistance are surely not enough? Flies other than the housefly have failed to develop resistance despite exposure to the same general conditions. Again, however, this seems an inadequate foundation for optimism; if different species of flies compete for food, the housefly population will inevitably rise as other kinds of fly succumb. Progress of any promise with other insecticides and insecticide combinations seems largely confined at present to laboratory hopes.

Anno Domini

A RECENT British Government report, made by a committee set up by the Minister of Labour and National Service, focused attention upon the length of a working lifetime. In Britain, in 1911 only 1 person in every 15 was a man over 65 or a woman over 60; by 1951 the proportion had risen to 2 in 15; and population statistics indicate without much doubt that there will be 3 in 15 by 1977. There are two main causative factors: by progress in medical science and nutrition we are living longer, and for some years families have been much smaller. There is a stark and quite inevitable consequence. Retirement ages will have to become higher. Within the next 10 or 15 years there must be a substantial adjustment in pension schemes, perhaps gradually approached as public opinion more readily accepts the basic facts. It is factually obvious that a country already highly populated and not over-blessed with native supplies of important raw materials cannot sustain a situation in which 1 person in 5 is living a medically extended life on pension. Nor is it callous to say this, for the value of pensions will deteriorate quite as rapidly as the economic imbalance reveals itself.

Agriculture, so often criticised for its economics by industry, may well smile at this social problem. For many generations those who work on the soil have accepted longer working lives. The agricultural labourer and farmer alike have seldom regarded 65 as ' closing time '; they have had little desire to discard that portion of life and living that is represented by pride in skill and the accumulation of experience. By contrast, workers in offices and factories have longed for release at 65, often enough with the predominant wish to cultivate a small plot of soil. Much will be said and written about ' ages of retirement ' in the next few years, but agriculture might well insist that the basic problems have been created by industrial and commercial conventions. Hard-fisted economists never concede that agriculture is a way of life with its own economic requirements; they talk of feather-beds and dear food. But it is industry and its offices that steadily raises the ratio of the pensioned population, not farming, and this fact is not wholly irrelevant to the ' feather-bed ' controversy.

Land utilisation in Britain

IN July last a noteworthy debate took place in the British House of Lords on the problems of land utilisation in Britain, which certainly deserves not to be relegated to the category of matters of ephemeral interest inasmuch as most of what was said on that occasion remains every bit as cogent as it was on the day it was uttered.

The theme of the debate, which was opened by Lord Winterton and to which many noble lords contributed informed discourses, was the large areas of land in Britain which could be put to agricultural use and yet remained derelict or abandoned, despite the urgency of the need for increasing domestic agricultural production, particularly in view of the increasing population and of the fact that demands for land for all kinds of development apart from agriculture

including rehousing, are estimated to amount to something of the order of 50,000 to 100,000 acres per annum.

In the course of the debate it was pointed out that visitors from abroad were frequently led to comment on the way in which land in Great Britain which could be used for productive agriculture or forestry was often allowed to remain derelict and unutilised, and to contrast this with what prevails in many European countries. Since 1887 the land available to farmers had decreased by 2¼ million acres, while the population had grown in the same time by some 14 million. In particular, much of the land which is reckoned as common land is not put to full productive use.

Among the suggestions then made for initiating improvement were the setting up of a general survey to assess the position and to make recommendations for improvements. In replying to the debate, Lord Carrington, Parliamentary Secretary to the Ministry of Agriculture, pointed out the efforts being made by his department to cope with the situation and referred to the marginal land reclamation scheme. He also referred to the difficulties attendant on dealing with land which had commoners' rights attached. He mentioned that during the war the Government had made use of emergency powers to ensure the cultivation of a certain amount of common land, and it was the intention of the Ministry to keep that land in production so long as the powers to enable them to do so existed.

To us it seems that the question of making full and proper use of available land is one of which the increasing urgency is obvious and it is to be hoped that the matter so well and so thoroughly ventilated in the Lords' debate will continue to be kept prominently in view.

Commodity prices

ON another page we reproduce the annual appraisement of the world situation in regard to agricultural production, largely based upon the invaluable survey produced by FAO which we have featured in our January number for some years past.

From this it is obvious that, after a delay much longer than that which occurred after the first world war, history is beginning to repeat itself and the world is facing the prospect of over-production of a number of primary products. Already prices for some raw materials have fallen almost catastrophically after having commanded for a lengthy period a range of prices which, if they cannot be described as exaggeratedly inflated, certainly afforded primary producers a margin of profit considerably higher than that which they had grown to expect during the long lean years before the second world conflict.

Products which have already felt the effects of this decline include rubber, tea, cotton, hard fibres and sugar. It is true that recently there has been some slight recovery in prices for most of these commodities, but they are still far below the levels they maintained in the immediate post-war era. The reasons why the decline in prices has been so long delayed are manifold; they include the fact that until recently trading in many of these staples was more or less rigidly controlled by governments, while wars and the threat of wars led to much government stockpiling; moreover, government subsidies have helped to maintain an artificial level of prices for commodities, the outstanding example being the American policy euphemistically known as price support. With a gradual and partial return to normal trading conditions, it seems, however, that the difficulties which were so sharply in evidence between the wars may recur and, in order to surmount them, the world may be driven once more to revert to the remedies which in the last resort have the most logical foundation, *i.e.* international arrangements to ensure that commodity production is maintained in step with world demand and that, if large surplus stocks exist, these are sequestrated and released gradually in order to lessen the effect of their impact on world markets. The recent preliminary negotiations for the implementation of a new international sugar agreement are a definite pointer and it seems not unlikely that it may be the forerunner for agreements in regard to other commodities.

Pesticide tolerances

AT the recent meeting of the Pacific branch of the American Entomological Society, reported in *Agricultural Chemicals*, an important discussion took place on the need for establishing tolerances for new insecticides as speedily as possible after they first appear. The spate of new insecticidal, fungicidal and weedicidal chemicals which has been such a striking feature of the agricultural situation during the past nine years or so shows no signs of abating; the discovery of the insecticidal effectiveness of chlorinated hydrocarbons and of the powers of various types of substituted phenoxy and similar compounds as selective herbicides has stimulated the organic chemists to prolonged bursts of synthetic activity, with the result that almost every day sees some addition to the already formidable array of compounds available for combating enemies of crops.

At this conference, a resolution was passed calling attention to the point that, whereas in the U.S.A. it is agreed that new pesticide chemicals should not come into general use until suitable restrictions on the amount to be tolerated in food have been established, yet, nevertheless, after long and expensive hearings of claims, no tolerances have yet been announced; the conference urged that this unsatisfactory state of affairs should be improved as speedily as possible by the adoption of laws or regulations which will permit any interested party to file a petition for the establishment of a tolerance for any pesticide chemical, will allow the Secretary for Agriculture to certify the usefulness of such a product and ensure prompt issue of certificates of tolerance with rights to interested parties to file objections thereto and to have recourse to the established courts.

In the course of the discussion, much stress was laid on the rigid nature of the requirements, on the large amount of capital and extensive research and testing operations which are involved before a new product can be launched, the difficulties inherent in finding efficient and appropriate applicators and the work that is required to bring the product to the notice of users.

In the U.S.A., the flood of new pesticides far exceeds in magnitude that in the United Kingdom, although here it is sufficiently large. In the U.K., however, some of the requirements indicated by the meeting are met by means of the official approval scheme. No doubt the need for such provision in the U.S.A. is real enough, although one may doubt whether the provision of the mass of legislation apparently contemplated may not in itself retard to some extent the achievement of the desired end with the clarity considered necessary. If action in the sense suggested by the conference is agreed to by the U.S.A. federal authorities, the result will be watched with interest in many countries and, if the results are satisfactory, in due course other countries will no doubt follow suit.

Indian sugar problems

A RECENT issue of the *Proceedings of the Indian Academy of Sciences* (**38,** 2B, 49, 1953) was wholly devoted to the sugar industry of that country, or, more accurately, to its manifold problems. Sugar is not cheap in India, but manufacturing technology, however progressive, will do little to reduce its price; 60% of the price is attributable to cane, 17% to Government charges, 12% to labour, salaries and interest, and only some 8% can be set against the broad costs of technology and research. Clearly the target for significant economy is to be found in the 60% sector, the cost of growing cane; and there, standing in the way of scientific advance, is the smallholding system, deep-rooted in the way of Indian life. Cropping rates per acre are sadly low and they vary in different Indian regions, *e.g.* 9.8 tons of cane per acre in Bihar and 32.9 tons per acre in Bombay. The average for India in 1950 was 14 tons per acre. Yet in Queensland 20 years ago a production rate of 144 tons of cane per acre per year was recorded, and in one instance in India, if only on three experimental acres, a yield of 122.4 tons was achieved. There is ample scope for yield improvement. Indeed, unless the yield of cane rises to an average of 30 tons per acre, the Indian sugar industry has no hope of competing in world markets, nor can it survive at home without tariff protection.

Probably the most fruitful path to higher production is the greater use of fertilisers. It is significant that in Bombay twice as much nitrogen per acre than the average for the rest of India is used and, as already stated, the rate of cropping in Bombay is more than twice the national average. The recent efforts to develop a substantial fertiliser industry in India, particularly the venture at Sindri, may stimulate the solution of this problem. Mechanisation is another necessity for progress; again the farms associated with the Bombay sugar factories set an example. But in most parts of India the small size of the holdings and the growers' lack of financial resources prevent a significant introduction of both fertilisers and machines. The prerequisite of scientific advice is the merging of small land units into larger ones. In short, as so often in agriculture, the problem is social, political and economic before it is realistically technical. It is greatly to the credit of the Indian scientists contributing papers to the symposium that they have stated these facts firmly and squarely.

British cotton purchase policy

IT is the definite policy of the present British Government to remove as soon, and as far as they conveniently and safely can, controls and restrictions on international trade in agricultural products and on domestic agricultural production imposed during the war as measures of necessity and continued with some modifications during the post-war years by their Socialist predecessors.

As part of this programme they have recently decided to abolish *in toto* the Raw Cotton Commission which was set up at the conclusion of the war by their predecessors to act as the sole buying medium for cotton imported into Great Britain. Early in 1953 the Government had modified the pre-existing procedure so as to permit spinners to elect whether they would continue to buy their requirements of raw cotton through the Commission or would procure them through their own resources. Some spinners elected to do the former, but a considerable proportion decided on the latter course. The disappearance of the Commission will entail that in future all spinners will have to obtain their supplies for themselves and, to meet this, it is proposed to reopen the Liverpool Cotton Exchange.

One difficulty, however, is that the R.C.C. has contracted to buy the production in cotton of a number of British colonial dependencies for some years ahead. On this point, in the House of Commons on November 17, Mr. Harold Wilson, M.P., asked the Minister of State for the Board of Trade what steps the Government proposed to take with regard to the long-term contracts entered into by the Raw Cotton Commission for the supply of cotton from certain colonial territories. In his reply for the Government, Mr. Heathcoat Amory stated that these long-term contracts, to which the colonial administrations concerned attach great importance, would be honoured by the Government and that consultations on methods of doing this would commence shortly.

Naturally, there is some curiosity as to the method the Government will select for carrying out this pledge. There is no doubt that so far as colonial cottons are concerned the R.C.C. performed a useful service by providing a ready market for the cotton produced in the smaller and newer cotton-growing countries and in inducing spinners to use the material obtained from them. Apart from British dependencies, cotton from Turkey, Syria, Greece, Iraq, and Belgian and French African territories have been affected by the operations of the R.C.C. There has always been a certain amount of difficulty in arranging ' cover ' for these ' outside growths,' as they are termed, even when before the war there were a number of important terminal cotton markets and difficulties over exchange did not operate to the extent which they do today. It certainly is important that the market for such cottons should not be impaired by the action taken in abolishing the R.C.C.

Mr. Heathcoat Amory in his reply remarked that it was obviously not possible to say with certainty whether there would be any fall in United Kingdom purchases of colonial cotton, but that the Government was satisfied that colonial producers should find no difficulty in finding markets for their cotton, provided they could produce it competitively.

World Agricultural Production in 1952-53

THE annual survey which FAO publishes of the state of food and agriculture in the world during the preceding 12 months is now an established feature. Its value is undoubted inasmuch as it is the only authoritative summary of the world position which is available, and since it enables an overall picture to be obtained of a matter which in the ultimate resort affects every living being on the earth, it is worthy of careful study by all thinking people.

Accordingly, in presenting the following condensed summary of the position in 1952-53, largely based upon this report, we do so with the feeling that we are rendering a service to our readers who may not all find it easy to obtain access to the original document.

*In accordance with our usual practice we give below a summary of the principal features of the world agricultural situation during 1952-53 and the outlook for the immediate future. It is, as usual, based upon the review of the position recently published by FAO.**

Introductory

Since the war the differences in agricultural production between the more developed and less developed regions of the world have tended to increase. Production has expanded rapidly in the agriculturally more advanced countries. North American production in particular has outstripped the growth of population; food consumption levels have improved, agricultural exports have doubled and, even so, large stocks of some commodities have recently begun to accumulate, in some cases to a disquieting extent.

In the less developed regions a good deal of progress has been made, but productivity per man and per hectare remains low. Food production has not kept pace with their increasing needs, and they have been forced to curtail their exports and to import more food from abroad. Their food consumption levels remain inadequate and in the Far East are even lower than before the war. Yet their earnings of foreign exchange do not permit them to import more than a limited quantitity of food, in spite of the larger supplies now available. In the long run these problems of the underdeveloped countries can be solved only by raising their own food production and, to the extent that markets are available, their production of export crops with which to pay for imports.

In some respects the year 1952-53 marks a new phase in the post-war food and agricultural situation. For the first time since 1939, although as yet insecurely, world production, on a global basis, caught up with the growth in world population. Moreover, the large stocks of wheat and other basic foods which have been built up in some regions should enable any future scarcities or potential famines which may develop in particular areas to be countered with much less difficulty than before.

At the same time, the recent accumulation of stocks of foodstuffs in the dollar area and of raw materials in some other countries, together with the downward trend of farm prices, inevitably give rise to fears of burdensome surpluses. If these fears retard future expansion, the results could be serious. The world's population will not stay still, but for some time to come is likely to grow at an accelerating pace as better medical services and, in some cases, better nutrition, continue to lengthen the life span in the less developed countries.

Agricultural production

Agricultural production continued to increase and slightly exceeded the growth of population. During the year both total agricultural production and food production regained the pre-war level, a result partly attributable to the generally good harvests which were experienced.

The expansion of production has, however, been very uneven. In North America it has greatly surpassed the growth of population, but in the Far East production has barely regained the pre-war level and is still 15 to 20% below the inadequate pre-war *per capita* figure. The Far East, with nearly half the world's total population remains therefore the central problem of the world food question.

Food consumption and imports

Food consumption showed few major changes of level compared with the previous year. Gradual improvement of diets continued in many countries, including North America, Western Europe, the Near East, Africa and Latin America, although in the last-named some local food shortages occurred. In Eastern Europe, drought in the Danube area caused food shortages in some Iron Curtain countries and in Yugoslavia. In the Far East, food consumption levels showed no great change since as rice production increased imports of other grains diminished. In Pakistan, food shortages occurred owing to drought.

*The State of Food and Agriculture 1953. Part I — Review and Outlook, Food and Agriculture Organisation of the United Nations, Rome, 1953.

Field cultivation in the Punjab

World trade

World trade, by volume, in agricultural products was lower than the previous year by 5% and was slightly below the pre-war level, a result of favourable harvests in importing countries and some reduction of importer's stocks and currency difficulties.

Industrial activity

In North America industrial activity was at a record level but in Western Europe it showed only a slight gain; in the underdeveloped regions some increases in industrial production occurred. The demand for foodstuffs and for certain raw materials therefore remained strong in them.

Farm prices and income

Farm prices declined sharply during the year as a result of improved supplies and the end of the Korean boom. Foodstuffs fell markedly in value in North America, and raw materials even more sharply in a number of other markets. In wheat, jute, cotton, rubber and sugar production has considerably exceeded the prevailing demand in many places at prevailing prices, and stocks have and are accumulating. In the United States, the Government price support policy has helped to nullify the effects of declining prices, but the Commodity Credit Corporation holds large stocks of wheat, cotton, dairy products, wool and tobacco while in other countries large stocks of sugar, rubber, cotton and jute have accumulated.

Except for some diminution in North America, farm incomes showed little change in more developed countries, larger outputs compensating for lower prices. In underdeveloped regions agricultural expansion continued to be handicapped by scarcity of capital. There have been some tendencies for governments, notably in South America and the Far East, to pay more attention to investment in agriculture. With unpromising prospects for the flow of foreign capital to underdeveloped countries, capital for development must obviously be found from domestic resources.

Outlook for future development

Industrial activity in most countries remained generally high through 1953 with continued active demand for many agricultural products. The accumulation of large stocks of some crops and raw materials is, however, causing concern in some countries. Although non-dollar countries, principally in Western Europe, still contribute the largest part of world trade, the world economic situation varies markedly with that in the United States. The main problem for 1954 is whether, if defence expenditures are materially reduced, other activities will expand enough to maintain industrial activity and provide markets for the expanding volume of primary commodities, especially food and agricultural raw materials. The future trend will be influenced largely by economic policies and developments in the United States and the course of world political events. In view of these uncertainties no attempt is made here to forecast the likely economic trend in 1954-55.

The unstable markets of the last few years for agricultural products, particularly raw materials, have brought few benefits and many disadvantages to producers and consumers alike. In some exporting countries equalisation schemes have been adopted to iron out price fluctuations. But recent experience underlines also the value of moving towards international agreements.

Europe

Agricultural production in North-Western Europe rose by 2% in 1952-53, continuing its upward trend and keeping pace with population increase. In Mediterranean Europe production declined somewhat and crop yields per unit area continued to be below pre-war. In Eastern Europe recovery continued slowly, with production *per caput* well below pre-war.

Imports of food including grain into North-West and Mediterranean Europe were lower due to improved domestic production and restrictions on imports. Even so total dollar imports of farm produce were maintained because of rising activity in the textile industries.

In the coming year, little change is expected in the volume or pattern of agricultural or industrial production owing to stable demands, while farm prices will also probably continue fairly stable although the downward trend of most prices may continue.

North America

The domestic demand during 1952-53 for the record output of farm products continued to be strong, but greatly increased supplies and declines in export outlets resulted in a sharp downward movement in farm prices. Farm costs dropped less and net farm incomes fell below the record height of 1951-52. In the United States, as a result of the price support programme, the Commodity Credit Corporation accumulated large stocks. For forestry products, the increase in United States domestic demand did not entirely offset reduced exports from the region. Fish landings dropped slightly below those of 1951-52.

In the United States, early estimates for 1953-54 indicate the third largest crop on record. Early Canadian crop prospects are also good. With a larger carry-over of wheat, corn, tobacco and cotton, and likely heavy marketings of livestock, total agricultural supplies in 1953-54 will be considerably above those in 1952-53. The large stocks in the United States cast a shadow of uncertainty over future prices and production. Wheat acreage in the United States is to be reduced in 1954 and marketing quotas will be introduced.

Demand for agricultural products in 1953-54 is not expected to change appreciably from 1952-53 and the reduced export demand of 1953 will probably continue except for special export disposal programmes. Demand for imported farm products may, however, be affected by any slackening of industrial activity resulting from armament reductions.

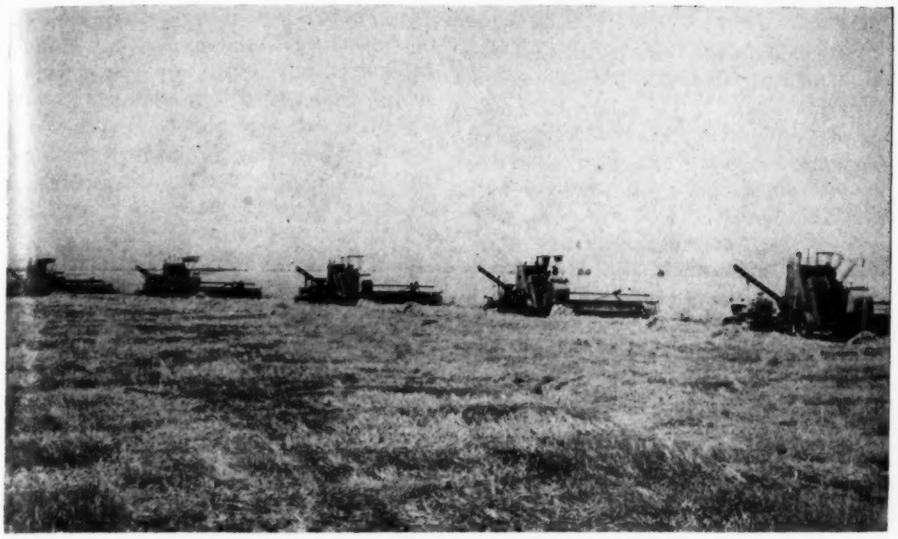
Latin America

Agricultural output in 1952-53 increased by about 9% over the previous year (3%, excluding Argentina). In 1952, because of reduced Argentine export availabilities, falling world demand and over-pricing of some Brazilian commodities on falling world markets, there had been a drop in agricultural foreign trade, but in early 1953 there were signs of an improvement, with greater quantities available for export and more settled foreign market conditions. Internal prices were generally steadier than in 1951-52 and in a few countries the cost of living declined.

Except for cotton, production prospects for 1953-54 are good, especially for foodstuffs. Internal demand for food and other farm products will probably remain high, as industry also is likely to continue expanding. Fishery and forestry production increased, but foreign trade decreased with declining imports and exports, reflecting slackening foreign demand.

Africa

Agricultural production increased moderately in 1952-53, but gross *per caput* food supplies were not appreciably different from those in 1951-52 because of larger food exports. Higher agricultural production seems likely in 1953-54 despite unfavourable weather conditions in certain territories. The implementation of long-range agricultural development programmes in most of the territories has been less rapid than anticipated, although previous shortages of personnel and equipment are being overcome and public investment expenditures are increasing.



Wheat being harvested by combines in Tunisia

Near East

For the first time since the end of the war, in 1952-53 *per caput* agricultural production appreciably exceeded the pre-war average. This expansion, however, tended to be concentrated in the food surplus countries. The volume of exports increased, particularly of grains, and the region was returning to its pre-war position as a net grain exporter. Increased production of food is indicated for 1953-54 despite droughts in Israel and Jordan. Economic development programmes are being actively implemented, mainly in the oil-producing areas, but in other countries inadequacy of investment funds may slow down appreciably future economic growth.

Far East

A record rice crop, a reduced wheat crop and a continuing decline in the value of raw materials exports, highlights the agricultural situation in the Far East in 1952-53. Demand for cereal imports from outside the region is still high because of a wheat crop failure in Pakistan, but supplies of rice within the region appear equal to effective demand. Production of other food crops, except pulses, continues the post-war rise. Most export crops show a slight decline, although they are still far above pre-war levels. Food crop production *per caput* is 15% to 20% below the very low pre-war standard. Both forestry and fisheries industries in the region's principal producer, Japan, expanded between 1951 and 1952.

Terms of trade declined between 1951 and 1952, making it increasingly difficult to pay for essential imports of food and development equipment. The prices of raw materials and other exports are levelling off, however, after their sharp declines from the Korean war peak. Both farm and retail prices of cereals produced for domestic consumption have remained stable in most countries. The prices of government traded rice continued their gradual rise, but free market prices steadied.

In line with stated national objectives and in response to various development projects, it appears likely that food production will continue to increase in 1953-54, but *per caput* levels will remain far below pre-war.

Oceania

Agricultural output was about 10% higher in 1952-53 than in 1951-52, mainly due to substantial increases in Australian production. The biggest regional advances were in wheat; meat and milk, and wool also increased over the relatively high levels of the previous year. These increases released a greater volume for export, at prices above those of 1951-52, thus contributing to the reappearance of surpluses on current account in overseas trade.

Present indications are that the physical conditions are satisfactory for a further increase in agricultural output in 1953-54. However, since the region is dependent on agricultural exports, anxiety is felt about cost/price relationships, particularly in Australia, in view of possible future changes in overseas demand.

The position in regard to commodities

The position in regard to some of the main agricultural commodities in 1952-53 is summarised below.

Wheat

World wheat production remained at a very high level, particularly in the exporting countries. Since large crops were also harvested in Western Europe and in India import demands were lower, and exports of wheat and wheat flour accordingly fell, notably from the United States. Stocks of wheat in exporting countries rose and the carry-over on July 1, 1953, reached an all-time high level. Prices were mainly steady, but fell sharply in some markets at the end of the year. Ample supplies will be available during 1953-54, but in the following year are likely to be affected by production restriction in the U.S.A.

Coarse grains

World production was somewhat higher than in the previous year; a noteworthy feature was the recovery in the Argentine crops. Prices were irregular, but with a downward tendency. The outlook for supplies in 1953-54 is favourable.

Rice

There was a notable increase in world production in 1952-53, but international trade did not expand much because the main part of the increase occurred in the rice deficit countries of the Far East. The upward trend of prices for 'free' rice stopped, but prices for rice sold under inter-government contracts rose further towards equalisation with 'free' prices. The replacement of rice by other grains in Asian countries appears to have taken on the semblance of permanence, but this in the future is likely to depend on the relation of prices for rice to those for other grains.

Sugar

World production of centrifugal sugar declined by 7% below the previous year's record, mainly owing to crop restriction in Cuba and unfavourable weather for the European beet crop. Sugar prices receded and made possible the removal of all consumption controls. Of note is the agreement reached at the international meeting in the United Kingdom in the late summer, which may provide a basis for the revival of the International Sugar Agreement.

Fats, oils and oilseeds

World production of fats and oils in 1952 rose moderately, but international trade declined about 10%. This decline was due mainly to a widespread tendency in importing countries to reduce stocks. Production plus net imports into Western Europe, the world's greatest importing area for fats and oils, declined about 5%, apparently reflecting a reduction in stocks rather than in actual consumption. The general level of prices of fats and oils in international markets, which had declined about 45% from spring 1951 to spring

1952, rose about 20% during the following 12 months.

Despite a slight reduction in world production of fats and oils in 1953, exportable supplies are about as large as last year because of increases in stocks held in exporting countries.

Fresh fruit

There has been in recent years a considerable expansion of trade in citrus fruit and some increase for bananas. While the United Kingdom imports of citrus fruit were reduced in 1952, imports into France and Western Germany reached a record high level. Apple exports in 1952 were 15% below 1951, as some importing countries in Europe had a very high domestic output and the United Kingdom reduced its imports for balance of payments reasons.

As a whole, Europe, the largest importer of fresh fruit other than bananas, is becoming more self-sufficient and total fresh fruit supplies in this region substantially exceed the pre-war level except in the United Kingdom.

Cotton

In each of the past two seasons the world cotton crop exceeded consumption by more than three million bales and for the second time in the post-war period stocks rose to a relatively high level. Prices are being largely upheld by price support operations in the United States, the premia on non-dollar cottons having virtually disappeared. Production outside the United States has, in recent years, increased significantly, but some governments have introduced acreage restrictions. These, combined with the fall in cotton prices, both absolute and relative to other crop prices, are reflected in reduced estimates of acreage for cotton.

Cocoa

Favourable weather conditions in practically all producing countries, except Brazil, resulted in a 10% increase in world production in 1952-53. World trade in 1952 declined by about 7%, due mainly to lower supplies from the 1951-52 crop and reduced imports into the United States and continental Europe. Prices settled on an average at about the high 1951 level, after a temporary rise at the beginning of 1952, when supplies appeared scarce.

Since no major increase in supplies is to be anticipated for 1953-54, prices are not likely to undergo substantial changes. The long-term rising trend in consumption appears to have been checked temporarily by high prices.

Coffee

Despite a further rise in world coffee production in 1952, total output was still 2% below pre-war. The principal increase was in the Western Hemisphere. Sustained demand throughout the year resulted in a continuation of stable prices at the high level reached in 1951. The 3% expansion in world imports went largely to Europe, while the United States imports remained slightly below the 1951 volume.

In 1953-54 production is likely to exceed, for the first time, the pre-war figure, unless frost in Brazil substantially reduces supplies. With a continued favourable outlook on the demand side, no major price changes are envisaged and over the long term an increase of supplies can be anticipated.

Tea

Although 1952 imports into the United Kingdom and the United States were higher than in 1951, world trade declined by about 4%, mainly because of smaller shipments from India, Pakistan and Indonesia.

Actual production was lower than in the record previous year, mainly on account of lower prices and drought in Ceylon and Indonesia. In India, where the price decline was most felt, production fell by 8% because of finer plucking. Exports from British African dependencies continued to rise. Prices declined severely in 1952, especially for lower-class Indian teas. The measures taken by India to curtail production contributed to a general rise of prices at the end of 1952 and early in 1953 and it would seem that short of a major recession in prices for primary products the outlook is for a continuation of high prices in the immediate future.

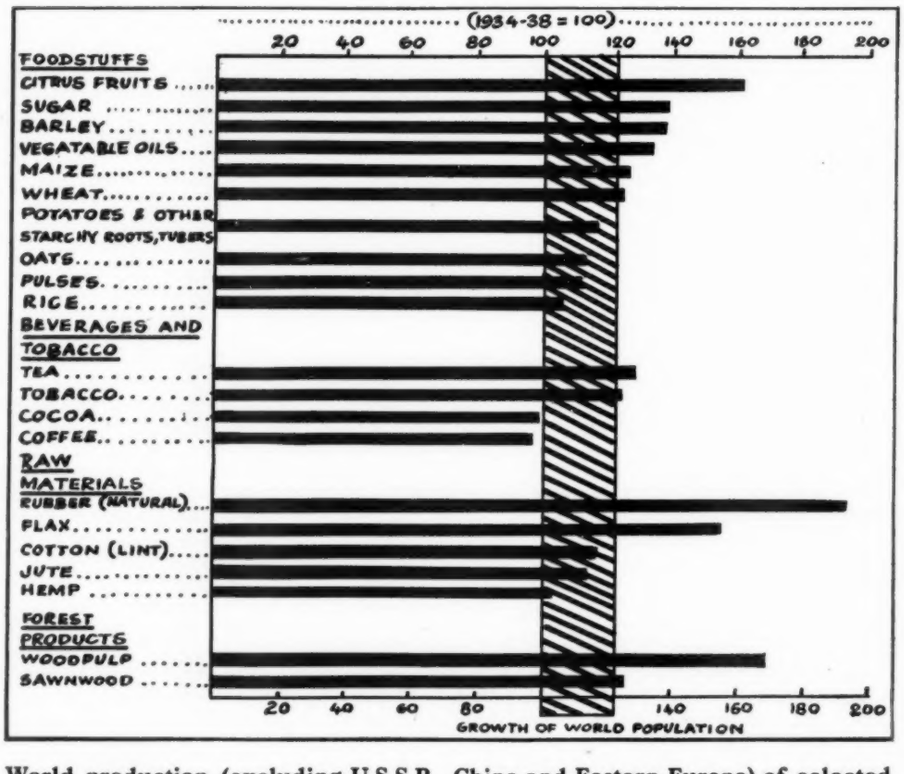
Tobacco

World production was slightly smaller than in the previous year, but world trade decreased by 15%. Stocks at the end of 1952 were substantially larger in the U.S.A., but much reduced in Great Britain. Prices for American and Canadian tobaccos were lower, but for Rhodesian appreciably higher.

In the U.S.A., production was lower by reason of the dry summer, but in Canada it was due to reduced planting. Exports from the U.S.A. decreased by 57,000 tons, mainly because of the cut in dollar allocations for American and Canadian exports by the United Kingdom Government. As a result of the large carry-over in the U.S.A., the acreage allotments to flue-cured and Burley tobacco have been cut by 7% to 8%, while total plantings in the U.S.A. may decrease by 6%.

Rubber

Over the past few years natural rubber production has been consistently above



World production (excluding U.S.S.R., China and Eastern Europe) of selected agricultural commodities, 1951-52—1952-53 average

consumption, the excess being mainly reflected in governmental stockpiles. While consumption of natural and synthetic rubber together continued to expand in conformity with the long-term upward trend, natural rubber was increasingly displaced by synthetic in the United States. In 1952, the decline in strategic purchases of natural rubber coincided with the full impact on consumption of this displacement and the downward trend in prices continued. By mid-1952, however, the United States Government lifted its rubber controls and, as prices of natural rubber are now competitive with those of synthetic, natural rubber is expected to capture a greater share of the market. The surplus, therefore, is expected to be reduced and to disappear within a few years.

Hard fibres

Production was maintained at record levels in 1952, with a further rise in sisal output offsetting the reduction in Philippine abaca occasioned by the typhoons. With demand still rather weak, there was some accumulation of stocks, particularly in Brazil and Mexico. Production appears to be adjusting itself fairly rapidly to the changes in the market situation that have taken place over the last two years. Hard fibre prices fell by 50% in the course of 1952 and there was some further decline in 1953. Drastic cut-backs in production are expected among high cost producers, particularly in Latin American sisal. Demand meanwhile may improve as cordage stocks are being reduced.

Forest products

The first post-war decline in the trade of most forest products except newsprint occurred in 1952. In North America, however, there was more stability than in Europe. By mid-1953 general confidence in forest product markets was restored and prices appear to have reached levels acceptable to both buyers and sellers.

Production in 1952-53 generally has followed price trends with some time lag. Production of industrial roundwood was maintained, but sawnwood declined slightly and woodpulp was slightly below the record level of 1951. The great instability in the industry in recent years has, however, caused serious economic difficulties to some producing countries because of rigid cost structures. The long-term outlook for demand for forest products continues to be favourable in the light of progress in industrialisation in many areas and improved living standards.

Conclusion

To sum up it can be said that 1952-53 has shown a marked improvement on preceding years in the total world production of food, but that difficulties have continued to be felt in making this increase available in the deficit areas where it is most needed. In regard to some agricultural commodities there is increasing evidence of tendencies to overproduction leading to surpluses, which may necessitate consideration being given to methods of regulating production to keep step with the potential of consumption.

Photos : P. 5, Pakistan Government, p. 7, Caterpillar Tractor Co.

A Pea Growing Conference

THE third conference on pea growing, organised by the Home Grown Threshed Peas Joint Committee, was held on November 9 at the Moot Hall, Colchester, in Essex. A large gathering of pea growers and others interested in the crop attended. The conference was welcomed to Colchester by the Mayor, Miss K. E. Sanders, who said that the town was a good centre for a meeting of this nature owing to the considerable growing of peas in the surrounding countryside.

In his introductory remarks, Mr. Leslie Mason, the chairman of the conference, congratulated growers upon the excellent quality of peas in Essex that year. He pointed out that the committee existed to assist growers and invited them to submit their problems.

Morning session

The first paper of the morning session was entitled ' Some Lesser Known Disorders of the Pea Crop ' and was read by Mr. J. D. Reynolds, N.D.A., C.D.A., the technical officer of the committee. He dealt with three disorders: pea root eelworm, marsh spot and pea moth. He thought that the fact that there were more outbreaks of eelworm was due more to the fact that its presence was more widely recognised, although it had been recorded at the end of the last century. The pea root eelworm is distinct from those attacking the potato and sugar beet. It is more serious on lighter soils and in the pea-growing areas of East Anglia. After describing the action of the eelworm, the speaker pointed out that the only real method of control is to practise a wide rotation.

Although marsh spot had been noted in 1845, it was not until 1936 that it was recognised as the result of deficiency of manganese. The speaker stated that the disorder was widespread, but was not generally recognised since it is necessary to examine the inside of the seed for evidence. The best control is by the spraying of manganese sulphate.

Mr. Reynolds finally dealt with pea moth, which is prevalent in Lincolnshire, Essex and Kent. He suggested that DDT is the best insecticide for control at present.

To complete the morning session, Dr. G. W. Cooke, of Rothamsted Experimental Station, read a paper on ' The Use of Fertilisers for Peas '; pointing out that there had been little guidance previously on the manuring of peas, he dealt with trials carried out with various fertilisers.

He showed that the method of application of fertilisers was important, producing good results when correctly carried out. He described trials carried out at Rothamsted and by the N.A.A.S. in East Anglia. These were with phosphate-potash fertilisers and showed that the fertiliser should be placed near the seed, but separated from it by an inch or two of soil. Dr. Cooke described fertiliser placement drills which had been devised for this purpose.

Afternoon session

The first paper of the afternoon session was by Mr. J. M. Proctor, B.Sc., the assistant technical officer of the committee. He spoke on ' The Practical Aspect of Weed Control in Peas,' dealing first with the difficulty of controlling weeds in peas as compared with those in corn. It was not possible, for instance, to spray so easily as with corn, and while corn can grow above weeds, weeds grow through peas. He felt that there was some danger of farmers being too ready to use spraying for weed control in preference to hoeing by mechanical means, which was considerably cheaper and, in his view, quite as effective, although, of course, spraying was necessary in some circumstances.

Following a paper on ' Quality in Harvested Peas,' by Mr. G. Horner, M.Sc., there was a short film on pea harvesting machinery. The conference concluded with an open discussion.

Developments in the Belgian Congo with Special Reference to Cocoa

D. H. URQUHART, B.Sc.

Cadbury Brothers Ltd.

The Belgian Congo is one of the most interesting countries in the tropics, and the developments in progress there are among the most striking in any part of the tropical world. The account which follows of certain aspects has special reference to cocoa production. The author, Mr. D. H. Urquhart, has recently visited the country on behalf of Messrs. Cadbury to whom we are indebted for permission to publish this report.

THE Belgian Congo is a vast territory dominating a great part of Central Equatorial Africa. It lies between 5° and 13° S. latitude and 12° and 31° E. longitude. It extends from the Atlantic Coast in the west to the sources of the Nile in the north-east, and south into the heart of Northern Rhodesia, covering an area of one million sq. miles. The territory in the main is low lying and flat or undulating, but there is a great deal of hilly or mountainous country on the eastern borders.

The climate immediately north and south of the equator (within the limits of roughly 2° N. and 2° S.) is wet and humid, and the country is mainly covered with rain forest. The dry season in this part of the Congo is short or negligible. Throughout the remainder of the territory there is a wide range of climates varying from fairly high rainfall to relatively arid conditions in the south-east. The territory is drained entirely by the River Congo and its tributaries.

The estimated population is about 12 million people. The eastern Congo is more densely populated than the rest of the territory.

Soils

In the extensive area of the Belgian Congo the variation in the types and characters of soils is considerable. In that part of the Congo Basin immediately north and south of the equator and west of 25° E. longitude the soils were laid down when this region was under water, and a great proportion of them are sandy and of low or marginal fertility. There are, nevertheless, within this area, considerable stretches of soil with the necessary amounts of soil nutrients, ensuring the fertility which makes it possible to grow relatively exacting plantation crops such as cocoa and coffee. It is mainly in this area that the Belgian Congo's plantation industries have been developed. These consist of oil palms, rubber, lowland coffee and cocoa and incidentally are the largest in Africa,

When it is realised that this area alone contains over 200,000 sq. miles it will be appreciated that the scope for selection of areas suitable for various plantation crops is very wide. The standard of skill exercised in selecting suitable soils and planting them has been very high, resulting in a large production of agricultural products for export.

Production and trade

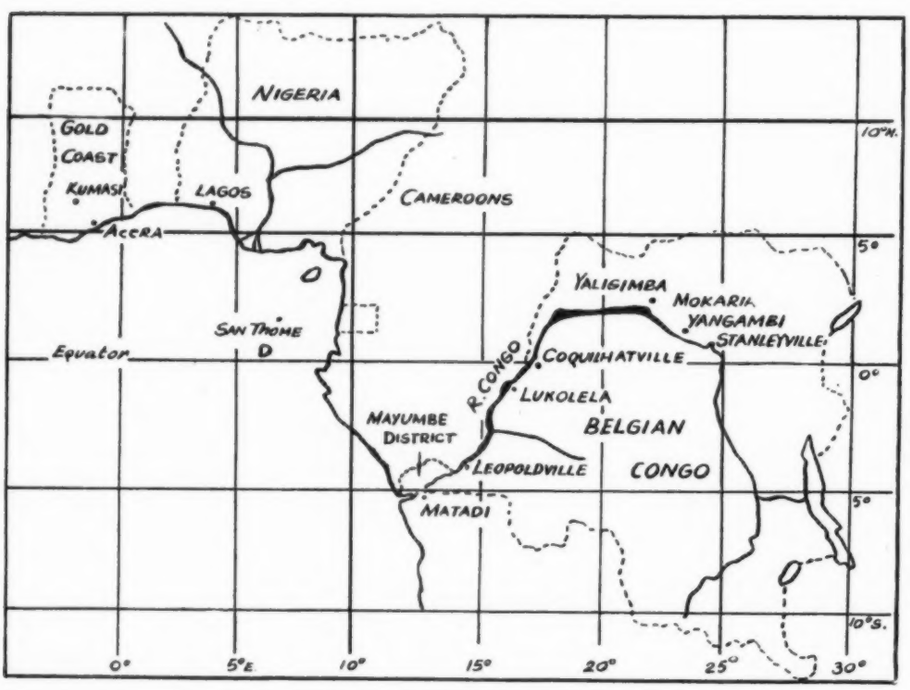
The exports of this region consist of minerals and raw and processed, or partially processed, agricultural products. The 1951 survey of trade shows that the total exports were 1,076,718 tons valued at nearly £142 million and that the imports totalled 1,122,822 tons valued at £100 million. Of the 453,000 tons of minerals exported (valued at nearly £70 million), copper accounted for more than half; the next most valuable mineral was tin, which amounted to one-seventh of the whole.

Raw vegetable products to the amount of 395,018 tons were exported to the value of nearly £46 million. One-third of the value of these exports was derived from cotton which was closely followed by coffee. Processed, or partially processed, vegetable products were exported to the amount of 201,209 tons, valued at £23 million. 75% of this was obtained from 132,016 tons of palm oil.

These figures give some idea of the enormous wealth of this country, and it is safe to predict that under its wise and progressive administration it will develop far beyond its present limits.

Plantation industry

Oil palm is the most important plantation crop. Referring to 1951 statistics,



The Belgian Congo and other cocoa-growing countries

there are 110,911 hectares of planted palms, including plantations in bearing and young plantations. In addition to this, there are added 52,217 hectares of natural palms, bringing the total under oil palms to 163,158 hectares. Coffee occupied 61,543 hectares followed by rubber with 56,957 hectares. Cocoa in bearing was 6,704 hectares and 11,552 hectares have been planted with young cocoa not yet in bearing.

Communications

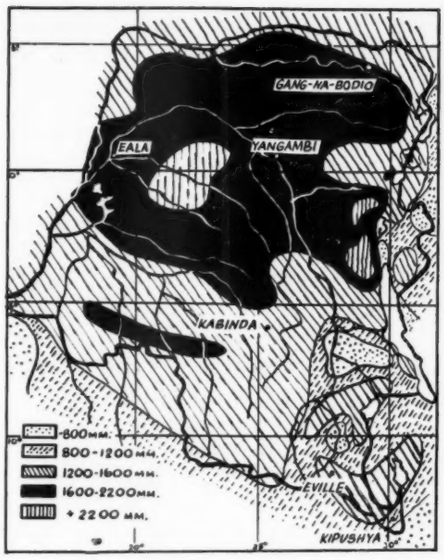
The main artery for transport is the River Congo and its tributaries as far as Leopoldville, but goods have to be transported thence by road or rail to the seaport of Matadi owing to rapids in the river. Road communications, which are at present inadequate, are being further developed. Railway transport is not yet extensively developed, but plans for linking up the railway systems of the interior with the port of Matadi and with the upper navigable reaches of the River Congo are included in schemes for further development.

Cocoa

The older cocoa industry is centred mainly in the Mayumbe district in the west. More recent planting of cocoa is in the northern part of the country immediately north and south of the River Congo. Cocoa was seen at the following places: The Botanic Gardens at Coquilhatville, Lukolela, two plantations between Stanleyville and the ferry to Yangambi, plantations of I.N.E.A.C. at Yangambi, H.C.B. plantations at Mokaria and at Yaligimba.

What is most remarkable about all the cocoa seen in the Congo is its uniformly healthy appearance. Where shade conditions are suitable, the growth of the cocoa is exceedingly good. At Lukolela cocoa plantations, the standard of management and plantation practice at all stages is high. New forest areas are exploited with care. There is a minimum disturbance of the humic surface layer and forest trees are left in sufficient numbers to provide shade for the young cocoa. Forest trees are planted to provide shade where their density is inadequate.

By these methods it should be possible to grow cocoa almost indefinitely as the humic layer around the cocoa trees is preserved from the beginning and is being continuously renewed by foliage and branches from the forest shade trees apart from what is being supplied by the cocoa trees themselves. The possible need of manures to supply major or minor elements to the soil at some stage is not overlooked.



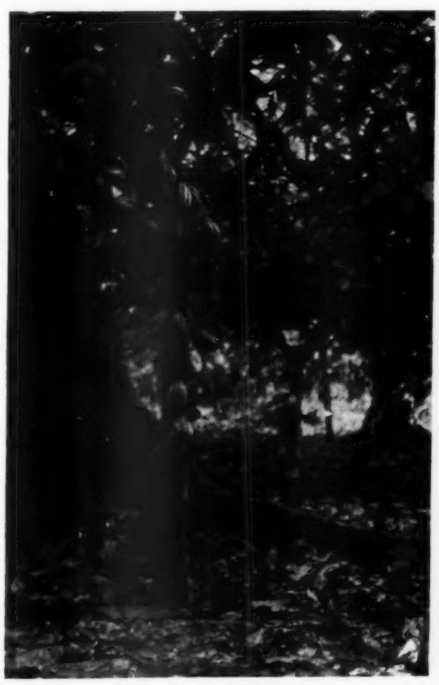
Annual rainfall in the Belgian Congo

Research

Government-sponsored research on agriculture is conducted by I.N.E.A.C. (Institut National pour Etude Agronomique au Congo Belge) with headquarters at Yangambi, and other stations distributed widely over various parts of the country. I.N.E.A.C. is the largest research organisation for dealing with tropical crops in the tropics and is concerned with a wide range of both permanent and annual crops.

Research on cocoa is mainly concerned with long and short term shade experiments, manurial trials which include the effects of certain minor elements, and with water-relations in the soil. Vegetative propagation by rooted cuttings has received a good deal of attention. Mr. Vallaeys, who takes a particular interest in cocoa, has applied the rooted-cutting technique evolved in Trinidad to coffee. He has visited the Gold Coast to study cocoa and spent a month there.

The Huileries du Congo Belge Company (H.C.B.) maintains its own research station at Yaligimba under the direction of Mr. S. de Blank, assisted by a carefully selected staff. The amount of work on hand is impressive, and although research is mainly directed to the needs of oil palms, rubber and coffee, the needs of cocoa receive due attention. A great deal of the credit for the enlightened and progressive methods used in establishing cocoa by H.C.B. plantations must be credited to the Director of Research.



A prolific cocoa tree

The future of cocoa in the Belgian Congo

The fact that of 49,600 acres under cocoa in 1951 28,800 acres represented young cocoa not yet in bearing indicates that there is considerable faith in cocoa as a plantation crop in this country. Although it is now difficult to find an unhealthy tree in Lukolela plantation, this was not always so. The cocoa trees were beset with the capsid *Sahlbergella singularis* to such an extent that the trees were greatly damaged and the yield depressed. By sustained efforts and experimental work over many years, M. de Bellefroid and his manager, M. Poncin, finally succeeded in bringing the capsid under control. Lukolela plantations must be given the credit for being the first to have evolved a method of control of capsids on mature trees which is both economic and effective.

The main problem at Lukolela now is the rejuvenation of the trees that have previously suffered severe damage from capsids. Chupons, or gourmands, growing from the main stem have a tendency to grow high before branching or ramifying. It is feared that the tops of these chupons may be too high for effective dusting against capsids. They are also too high for convenient harvesting. The problem of controlling the height of the chupon, which will eventually take the place of the original tree, is one which is being studied at the moment.

Cocoa was first planted in H.C.B. plantations at Mokaria as an intercrop with rubber or oil palms. The policy now is to plant cocoa as a sole crop and not as an intercrop with other permanent crops. By a careful study of the forest trees and selective felling, a remarkably good degree of

shade has been achieved. Trees whose foliage provides the required degree of shade are left. In the absence of the ideal tree it is sometimes necessary to leave trees whose foliage is unduly dense, but these will gradually be replaced by suitable types planted for the sole purpose of providing shade.

This careful and enlightened approach to the exploitation of the forest for cocoa planting, as practised in the Belgian Congo, is one worthy of careful study by those concerned with the cocoa industry in West Africa. The export of cocoa beans is now over 2,000 tons.

I did not visit the Mayumbe region, but I am confident that a soil reconnaissance could discover more areas in the region immediately north and south of the equator, in country climatically suitable for cocoa, where cocoa could be profitably established.

Tree selection is practised by the more progressive plantations and by I.N.E.A.C. But as the material is almost exclusively Amelonado type, the extent to which yields can be stepped up by this means is limited.

Again, plant breeding must be restricted by the limited range of material available. The Belgian Government is rightly jealous of its plantation industry and is cautious of introducing plant material from other countries where there is the risk of introducing disease. Malaya is equally cautious in this respect, but Malaya has allowed the introduction of cocoa material from the West Indies and from the Gold Coast after it was assured that adequate precautions made it possible to ensure that no disease could be introduced. I consider that the Belgian Government might, with advantage, consider a similar step, especially as regards introductions of cocoa material from the West Indies where such material for export to other countries is grown in isolated disease-free conditions. Belgium has, I believe, similar facilities for growing tropical plants as obtain in Kew where plant material, intended for transfer from one tropical country to another, undergoes a period of observation before being sent to the importing country.

A cocoa tree being pruned. Note dense foliage

It seems a pity that a country such as the Belgian Congo, which has an undoubtedly high standard of plantation practice and research facilities, should not have access to the best planting material available in the world, provided that such material can be put at the disposal of the plant breeder without endangering the plantation industry.

Conclusion

The Belgian Government, in giving priority to the needs of the African population, have directed their soil investigation mainly to the more densely populated areas of the eastern Congo. Acute problems of soil erosion and degradation in these areas have naturally called for urgent attention. The areas west of Stanleyville, where much of the plantation industry is now established, has had less attention. When pressure of work permits there is no doubt that a soil reconnaissance of this area would aid and accelerate its development.

Forestry and Timber Congress

A congress was held in Stuttgart, from September 7 to 12, under the aegis of the European Productivity Agency and the Timber Committee of the Organisation for European Economic Co-operation, to study problems connected with increased productivity in the forestry and timber industries. The object of the congress was to ascertain to what extent it would be possible to put into practice the recommendations of national and international technical assistance missions, which have visited the United States during the last three years.

Nearly 300 delegates from nine European countries (Austria, Belgium, France, Germany, Italy, Netherlands, Norway, Sweden and Switzerland) and from the United States and Canada took part in the congress. Trade unions were represented as well as all branches of industry dealing with timber: growing, felling and sawing, processing industries and marketing. Several governments, as well as a number of national and international organisations, were also officially represented.

The eight sections of the congress dealing with general productivity problems in the timber industries (practical approach to problems, growing, felling and transport, sawing, processing industries, use of waste and market organisation) drew up resolutions and recommendations which were approved after discussion by the congress in plenary session. The resolutions and recommendations cover a wide field, ranging from forestry to timber processing. Some are addressed to the trade as a whole or to trade federations, others to governments, others again to government organisations dealing with timber.

The importance was recognised, from an international point of view, of countries being able to exchange experiences and co-ordinate efforts, not only in regard to technical and scientific questions, but also in economic matters; the congress therefore expressed the wish that international trade associations should be formed in the various sectors of the forestry or timber industries which are not organised on a European scale (*e.g.* timber production, felling, transport and sawing, and marketing). It was also judged advisable that a European timber council, on which the chairmen of the international trade associations would sit, should be set up to co-ordinate the work of all the international federations. The congress appointed six leading members of the trade representing its various branches to make the necessary contacts.

As regards trade co-operation on a European scale, the congress further recommended the formation of groups, in which all the countries would be represented, to study problems connected with plantations outside forests, the use of fibreboards, the use of waste, etc. It was also agreed that a glossary should be prepared for publication in seven European languages, which would include about 2,000 technical terms relating to timber, semi-finished products and marketing. Lastly, a number of recommendations of a purely technical nature were adopted.

Land Reclamation Schemes in India

S. RAMANATH

The central and provincial governments of India are making great efforts to increase agricultural production, especially of foodstuffs, and in many of the Indian States have undertaken large schemes of land reclamation. An account of some of these schemes is given below.

THE transformation of fruitful land into desert and waste land has been going on since very ancient times. In India, large tracts of land are being lost to cultivation by soil erosion, growth of Kans grass, swamps, etc. Due to the denudation of forest and hill lands of their protective vegetation, soil erosion is most conspicuous in the Himalayan foothills and in the low dry hills of peninsular India. It is in such areas of poor rainfall that the greatest damage from erosion occurs. Many of the hilly tracts show large acres of bare rock which in comparatively recent times were covered with a protective vegetation which acted like a sponge, holding rain water as it fell and enabling it to percolate gradually downwards on its journey to the plains where it fed the subsoil and smaller streams and rivers. The soil and its covering thus served a double function, *viz.*, the production of more vegetation and fodder and deepening of the soil in the rocky hills and, by acting as a valve, guarding and controlling the water supply of the lower levels. The removal of the protective herbage exposes the soil to the erosive action of rain and destroys its porosity and its profile. Hence, when rain does occur, it washes away the surface soil so that not only is the soil lost, but the rain water is also lost, both locally and in the lower areas. The inevitable result is the incidence of floods during rains and drought soon afterwards.

Soil conservation

The Five Year Plan sponsored by the Government of India, includes a special provision of Rs.2 crores for soil conservation. A desert afforestation research station has been established at Jodhpur to deal with the problems created by the advance of the Rajputana desert, and a soil conservation branch has been created at the Forest Research Institute, Dehradun. Soil conservation demonstration centres are being set up in Madhya Bharat, Pepsu and Delhi. At Sahibnagar, in Hyderabad State, about 1,500 acres of eroded land belonging to the State have been placed at the disposal of the Soil Conservation Research station, and experiments already in hand include the determination of the run-off, the loss of surface soil and a study of improvements in plant growth consequent on problems occurring. An area of 25 acres has been set apart to test the suitability of various species of plants for these eroded lands, and 30 species have already been tried. Under the aegis of this research station extension work has been undertaken in the Bidar and Osmanabad districts. The area treated is about 6,000 acres. This experimental station, which is financed by the Government of India, will deal with the conservation of the stony soils of the Deccan where the range of rainfall is between 25 to 30 in. a year.

Detailed proposals for the setting up of a central organisation for land utilisation and soil conservation recommended by the Planning Commission are at present under consideration. Other schemes will be initiated by this organisation in consultation with State Governments.

Fight against kans grass

Kans grass (*Saccharium spontaneum*) is a member of the sugar cane family. It appears on Indian farms generally after the monsoon and grows rapidly on soils capable of retaining moisture. While such soils are very suitable for food crops, they are also equally good for kans, and when this weed and grain crops compete the odds are in favour of the weed. The peasant with limited means at his disposal cannot hope to reclaim the land if it is infested by kans, and ultimately abandons the field and moves to another plot, there to wait for the inevitable arrival of the weed. About three million acres of land are infested by kans in southern Uttar Pradesh, Madhya Pharat, Bhopal, Madhya Pradesh and Western Vindhya Pradesh.

In order to reclaim land infested by kans the Central Tractor Organisation, formed at the end of the war, put about 90 caterpillar bulldozers and tractors on the job and has been able to reclaim so far about one million acres which would have remained infested or become a greater and advancing menace but for the work of this organisation. The success of this reclamation work encouraged the Government to formulate a new scheme for the purchase of 375 new tractors and the necessary land clearing equipment. The International Bank for Reconstruction sanctioned a loan of $10 million for this scheme with which 180 machines were purchased as a first step and more machines were added later. At this stage, the Government of India decided to consolidate the work of the organisation to 240 machines. They therefore surrendered

A view of the Kans, shrubs and trees to be cleared before reclamation

the balance of the loan sanctioned by the International Bank after making provision for the purchase of essential spare parts and equipment required from dollar areas. Of the 240 tractors which the organisation now possesses 30 are for jungle clearing, and so far 37,000 acres of jungle land have been cleared. The C.T.O. has the largest fleet of heavy tractors for this type of reclamation work in the world. Capital equipment has cost Rs. 7.5 crores, while the annual expenditure including capital expenditure is about Rs. 2½ crores. It is also expected that the C.T.O. will be able to reclaim about 280,000 acres of kans land yearly for the next five years. The areas reclaimed by the C.T.O. during 1951-52 and up to April 1953 in certain States are shown below:

	1951-52 *Acres*	1952-53 (*Up to April*) *Acres*
Madya Pradesh ..	72,004	38,795
Uttar Pradesh ..	59,417	35,230
Madhya Bharat ..	44,526	58,807
Bhopal	79,420	25,897
	255,367	158,729

Normally the C.T.O. starts ploughing in January and stops in May. This short working season is one of the handicaps of the organisation which is not commonly appreciated. Before ploughing can start, the soil has to be sufficiently dry to prevent the kans from taking root again. Hence it can usually start work only in January. It has to stop work sufficiently early to give two or three weeks for the kans root to desiccate and die before the south-west monsoon begins. That is the reason for stopping the operations towards the end of May. After the season's operations the machines are pulled back to their bases ahead of the monsoon for repair and overhauling. Each unit consists of 15 machines of which seven are fitted with special land clearing equipment and there are bulldozers, graders, scrapers, mobile workshops, lubricators, tank tailors, trucks, pony tractors and Landrovers. The clearing machines start their work as soon as the ground is hard enough for the tractors to operate. The best part of the ploughing operations are accomplished in April-May.

The C.T.O. is working on a ' no profit—no loss ' basis and the cost of reclamation has been tentatively worked out at Rs. 52 per acre. The organisation reclaims only such land as is indicated by the State Governments. These governments in their turn recover the ploughing charges on instalment basis from the beneficiaries. It can be claimed that the operations of the C.T.O. have brought extensive areas under cultivation, yielding about 500,000 tons of additional food grains. The average area of reclamation is about 250,000 acres per year. In addition, the organisation has constructed about 50,000 miles of approach and feeder roads as well as numbers of protector bunds, irrigation tanks and village tanks.

Work against Kans in progress

Reclamation in Uttar Pradesh

One of the spectacular jobs successfully undertaken by the C.T.O. is jungle clearing in the Nainital-Tarai area in Uttar Pradesh. In this area about 100,000 acres infested with wild animals and malignant malaria have been converted into prosperous co-operative colonies and flourishing State farms; 2,613 families, consisting mainly of displaced persons, political sufferers and ex-Servicemen, have been settled in well laid out colonies. Adequate provision for communications has been made by the construction of 38 miles of metalled and 43 miles of unmetalled roads. For irrigation, 29 tube wells have been sunk. A large part of the area has also been provided with electric power. A large State farm of about 16,500 acres, divided into three blocks, has been started in the reclaimed area.

In the Ganga Khadir colony inaugurated by the U.P. Government, an area of about 47,000 acres is being reclaimed by the C.T.O. In it 480 refugee families have been settled, each family being given a 10-acre plot, an advance for the purchase of a pair of bullocks and an additional half acre of land for a kitchen garden. In addition, areas of 1,000 acres each have been allocated for a State farm for demonstration and seed purposes, a collective farm on the Russian model and a dairy farm, while ten village co-operative societies have also been formed in this area.

In addition, contour bunding, which is most valuable in areas of scanty rainfall, has been carried out in the Bundelkhand area and the State Government has spent about Rs. 6.6 lakhs in bunding an area of 6,300 acres.

Reclamation in Assam

A fertile forest area of little over 13,000 acres, roughly seven miles long and about three miles wide, known as the Kaki area in Assam, formerly infested with wild elephants, tigers and poisonous reptiles, is now the scene of large-scale reclamation activities. For developing this area the Government of Assam has entered into an undertaking with an Indian firm in Calcutta under which the Government has purchased a complete unit of machinery, including bulldozers, winches, tractors, ploughs and harrows. The Government provides the necessary staff who work under the supervision and guidance of a team of trained men deputed by the firm. The firm will, in addition, assist in training the staff recruited by the Government, the idea being that after the completion of the Kaki scheme the State will have available supplies of trained workers who can independently handle similar jobs. When the scheme was first put into operation it was felt that the development of communications was an essential prerequisite for success, while the sanitary position in the area was far from satisfactory. Accordingly, new roads and bridges were constructed to improve communications, medical and health services were established, and camps and barracks were constructed to accommodate the staff working in the area. Settlement of the land will be undertaken as each block of about

200 acres is reclaimed. Steps will also be taken to start cottage industries to provide spare time jobs and to develop multi-purpose co-operatives for the marketing and processing of produce. The scheme, as a whole, is considered to be progressing satisfactorily.

Other reclamation activities of the Government of Assam include the development of 52,400 acres of waste land in backward tribal areas with a view to increasing food production. The scheme is to be completed in five years and is expected to cost Rs. 19.72 lakhs. About 25,600 acres will be reclaimed in the Rang Khang area in the Mikir Hills and in the Nambor area, also in the Mikir Hills, 2,500 acres will be annually put under the plough to reach a target of 12,800 acres. Development of agriculture in the North Cachar Hills in the Deger, Lanling, Hatikhala, Salikantapur, Kalimabong Rangkhol areas and in the region between Harangajao and Ditokchera, where about 14,000 acres will be brought under cultivation, is expected to make this deficit locality self-sufficient in food production.

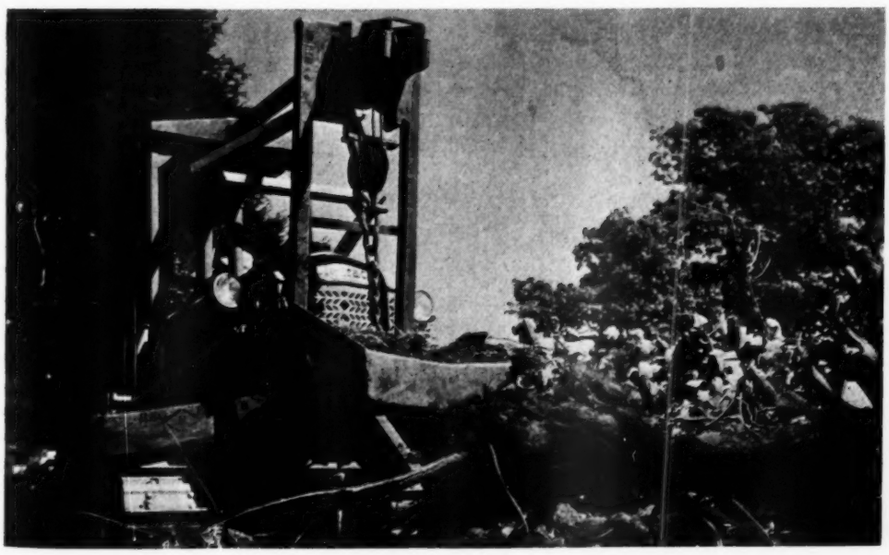
Three more development blocks have been allotted to Assam. These are the North Lakhimpur block, the Nowgong block and the Lushai Hills block. These development blocks cover an area of 1,814 sq. miles comprising 1,596 villages. In the Garo Hills, 800 bighas of waste land have been made fit for cultivation by voluntary labour and paddy has already been raised there. Similarly, the people in the Cachar and Mikir Hills project area have brought waste land under cultivation by voluntary labour.

Developments in Bombay State

In the scarcity districts of Bombay, contour bunding and trenching of 600,000 acres and the improvement of 117,000 acres of land have been completed. During the first year of this plan an area of 57,000 acres was covered by new bunding, while 117,000 acres benefited by bunding during the second year. Under the mechanical cultivation scheme 308,000 acres have been covered by deep and shallow ploughing and harrowing. Up to the end of March 1953, 27 schemes covering 13,500 acres for the reclamation of khar land had also been completed. Nearly 28,000 acres of land are estimated to have been irrigated by wells under a scheme for the ' construction of new wells and repairs to the existing ones ' during the first two years of the plan, and as many as 94 co-operative societies have undertaken lift irrigation since the first year of the plan, covering a total area of 20,395 acres.

Developments in West Bengal

Forming an area of over 100 sq. miles on either side of the River Piali was a vast lake dotted with small villages on high land as a result of the rapid silting of the river and the lack of a proper drainage outlet. Attempts were made to drain the water into the River Piali, but the rapid silting of the river made this plan ineffective. Draining by pumping was the only alternative and the West Bengal Government prepared an ambitious scheme known as the Sonarpur-Arapanch drainage scheme to reclaim an area of 37 sq. miles at a cost of Rs. 44 lakhs. Four giant pumps, capable of discharging 375,000 gal. of water per minute, were installed at Uttarbhag and started functioning on May 31, 1953. Within the few months that the pumps have been at work 26 sq. miles of land have been drained and by next year the total area will have been reclaimed. The second part of the scheme is concerned with 51 sq. miles of land to the west of the Piali, and for this area channels will be cut and sluice gates built. The total scheme will cost nearly Rs. 1 crore; 15,000 acres have already been reclaimed and out of this 10,000 acres have been brought under paddy cultivation—1,500 acres being cultivated by the State Department of Agriculture and 8,500 by local farmers. A sum of Rs. 1¼ lakh has been distributed to local farmers as loans for purchase of cattle to promote cultivation in this area. It is expected that another 8,000 acres will be reclaimed in the next few months.



A tree uprooted by the clearing equipment is being pushed aside. Reclamation work by C.T.O. at Bhopal

The Mayurakshi Reservoir Project

Another great project undertaken by the Government of West Bengal, the Mayurakshi Reservoir Project, will reclaim 25,000 acres of waste land when completed. The project will irrigate 600,000 acres in the Kharif season in the districts of Birbhum, Murshidabad and Burdwan, and 30,000 acres in the district of Santal Parganas in Bihar.

Development of salt lakes

The West Bengal Government approached the Central Finance Ministry recently for the release of Rs. 4.5 lakhs worth of foreign exchange to meet expenses that will be incurred in preparing a final plan for the reclamation and development of the salt lakes near Calcutta. The final plan will cost about Rs. 10 crores and separate proposals have been made for the development of the northern and southern portions of the lakes.

For the northern portion, it has been suggested that an area of about 5 sq. miles should be developed and raised to a high level with silt from the bed of the River Hooghly for the construction of a township. The water from the remaining area of 15 sq. miles will be pumped out into the water channel of the Calcutta Corporation. Part of the southern section, comprising a total area of 4 sq. miles, is to be developed into a fresh water lake as a source of water supply to the south Calcutta area. A silting basin will be constructed to feed the proposed lake. To ensure a regular flow of water into the silting basin from the Hooghly, Tolly's nullah will be widened and deepened.

One of the main features of the schemes is that they will make available large tracts of land for settlement of displaced persons,

A tractor in operation outside Ganga Khadir Colony, Uttar Pradesh

thereby relieving population pressure on Calcutta. The development of this area will also mean the elimination of breeding centres for malaria mosquitoes.

Reclamation in Cochin

Work in connection with the reclamation of 166 acres in the south-east of Venduruthy Island, the Cochin naval base, is nearing completion. The land is to be reclaimed from 15 to 18 ft. of water in the Ernakulam channel. The work is being done by the Cochin port authorities. The land will provide additional space for the navy for expansion. The total length of the reclamation wall to be erected is estimated to be 11,500 ft., out of which 6,000 ft. have been completed to the full height and 5,000 ft. to more than half the required height. Construction of the wall is expected to have been completed by the end of 1953.

Reclamation of swamps in Orissa

In the province of Orissa there are a large number of swamps serving as reservoirs for water draining from the surrounding country. During the rains these retain too much water for the growth of crops, while in summer they become mud patches serving no useful purpose; on the other hand they are a major contributing factor in rendering the entire locality insanitary. The development department of Orissa State decided to utilise these areas and to convert the swamps to fish farms on an economic basis. Hitherto reclamation of swamps has been considered an expensive proposition and there has been no guarantee that a reclaimed swamp would not revert to its original condition unless large sums are provided for maintenance costs. In view of the various difficulties in converting large swamps into economic fish farms, a scheme has been prepared to deal with different types of swamps on an experimental basis.

To start with, tanks that have fallen into disuse were selected as they provided the least difficulty regarding drainage and the contour of the bottoms was more or less uniform. Natural swamps present greater difficulties in this respect and planning of fish farms can only be done as the work progresses. The operations involved in reclamation are usually as follows:

(1) Removing water by gravity drainage or by power pumps or both.

(2) Making contour surveys of the tank bottom after weeding and planning the fish farm. This is rendered difficult on account of the boggy nature of the swamps, which often take months to dry.

(3) Conversion of the swamp to fish nurseries and stocking them.

(4) Fitting of sluices.

During the last three years the Government of Orissa has reclaimed about 200 acres of swamps, involving a total expenditure of about Rs. 2½ lakhs. The latest example of such work is in Kaussalyaganga, involving an area of 230 acres at a total cost of Rs. 425,000. During the work 3,000 men and women were employed for two seasons, 60 million gal. of water were pumped out, 82.7 million cu. ft. of earthwork was constructed to form the partitioning embankments and 400,000 fish fingerlings were used to stock the reservoir reclamation. An income of 10 maunds of fish per day amounting to Rs. 400 is expected from this scheme.

State tractor organisations

Accurate figures regarding the reclamation programmes carried out by State tractor organisations are not yet available. The total number of tractors imported into India, on Government as well as on private account, during the half year ending June 30, 1953, was 2,151, valued at about Rs. 12 crores. This was an increase of 542 over imports during the corresponding period last year. Several State Governments maintain fleets of tractors with which they undertake not only reclamation but also mechanical cultivation of land for the benefit of private parties, and in Madhya Bharat and Madhya Pradesh follow-up cultivation in areas reclaimed by the Central Tractor Organisation is carried out. The statement below shows the number of State-owned tractors in certain States.

State	*Tractors owned*
Madras	299
Bombay	256
Uttar Pradesh	492
Punjab	89
Madhya Pradesh	100
Assam	40
Hyderabad	51
Madhya Bharat	27

The progress of work in most of the States has been rather slow because experienced technical personnel are not readily available and it has proved difficult to make satisfactory arrangements for repairs and the supply of spare parts.

On the basis of reports received from 15 States, *viz.*, Assam, Bihar, Bombay, Madras, Orissa, Punjab, U.P., West Bengal, Hyderabad, Madhya Bharat, Mysore, Pepsu, Rajasthan, Coorg and Delhi, the area reclaimed and mechanically cultivated by State tractors during the period July 1952 to March 1953 was 161,459 acres against the target figure of 506,258 acres for the agricultural year 1952-53.

Conquest of the Desert Exhibition

At a 'Conquest of the Desert' exhibition held recently at Jerusalem, Israel, the Shell Company of Palestine Ltd. presented a pavilion designed to show the important role petroleum has played in the conquest of the desert, and the widespread application of petroleum products in agriculture, industry and the home. The theme was illustrated by a series of dioramas which traced the story of Shell's operations in Israel from the arrival of crude oil to its final processing and application.

Control of the Potato Root Eelworm

DR. JOHN GRAINGER

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Potato root eelworm has of late attracted considerable attention. It is probably the most destructive of the numerous species of nematodes which attack crops. It was mentioned in an article on Nematodes in WORLD CROPS, *Vol. 2, page 11, by Dr. B. G. Peters. Recent developments in controlling the pest are reviewed below by Dr. John Grainger.*

THE potato root eelworm, *Heterodera rostochiensis* is a serious disease of potato crops in temperate regions (Figs. 1 and 2). Its present known range is mostly confined to western Europe, but an outbreak in Long Island, U.S.A., gives warning of its possible spread to other areas of suitable climate. Although it has not yet been reported from the temperate zone of the southern hemisphere, there would seem to be no biological reason why it should not appear there, but recent international quarantine regulations should go far towards limiting transfers to such areas.

The disease

The effects of eelworm attack on potato growth begin as soon as the soil temperature reaches about 40° F., and the effect on yield of main crops is staggering. Reductions of 80% have frequently been recorded, with the remaining 20% consisting of tubers too small to be marketable for ware. Growth of first-early potatoes, particularly of the variety Epicure, represents the only ecological method of reducing losses, but even in such settings the diminution of yield is frequently about 40%. The variety Epicure can make considerable growth at low soil temperatures. In the foreshore fields of the counties of Ayr and Wigtown, the first-early crop, sown in February, is well established before the soil temperature rises and the eelworm population becomes active. The crop on this restricted area is, moreover, frequently lifted in the first week of June, before the eelworms have had a chance to complete their life cycle. Cysts are indeed present on the roots, but are white or pale yellow at the time of lifting and experiments show that such cysts make but little contribution to the permanent infestation of the soil.

The severity of the disease is largely independent of a wide range of factors in soil nutrition, and the only alleviating addition available to the farmer is that of farmyard manure or other bulky green manures. When such material is present in the soil in a certain stage of decay it delays the attack of eelworm on the potatoes but does not prevent it. Even this slight alleviation is not always practical, however, for the strong growth with farmyard manure can, under certain conditions, accentuate the build-up of the eelworm population.

Infestations on main crops are often so widespread as to menace the continued growth of the crop, and if the spread of eelworm is then allowed to continue unchecked, it may well be that the only possibility of growing potatoes as a paying crop is to grow first earlies in special situations. The foreshore districts of Ayrshire lie in a narrow belt only a few fields wide from the sea. They are generally raised beaches, have higher ground inland and are relatively frost-free, for the slight katabatic winds formed during radiation frosts flow right out to sea and do not build up into 'frost pockets.' These areas, moreover, being coastal, have not such extremes of climate as more inland parts. The variety Epicure is invariably planted and, in spite of an almost universal infestation with potato root eelworm, crops are grown year after year without rotation. Some fields have, in fact, grown potatoes for 80 years or more but this practice is only possible because of the very early planting and lifting. This form of husbandry is only economic because of the high prices received for the produce in early June, ranging between £28 and £42 per ton of recent years.

Topographical spread of the disease

Cysts of *Heterodera rostochiensis* are carried from place to place in soil adhering to implements, boots, the feet of animals, etc. This mode of spread, though seemingly trivial, is nevertheless very potent in agricultural practice. Cysts can also occur on the surface of potato tubers, apart from their presence in adhering soil. This channel of spread, however, is now largely closed because of insistence that crops grown for certified seed shall be free from visible infestation. Regulations covering Stock Seed certificates now require the additional check of previous soil examination. If cysts are found in soil from a particular field, that field may not be used to grow seed potatoes. There are, however, practically no measures applied to control spread from infested to clean land within a country. Methods for this are not very popular, since they would involve the decontamination of all incoming traffic—the boots of visiting inspectors and advisory officers, the wheels of borrowed machinery and even the roots of plants brought in such as strawberry runners and raspberry

Fig. 1.—This shows the severe effect of eelworm infestation (foreground and left) compared with the vigour of healthy plants (background and right)

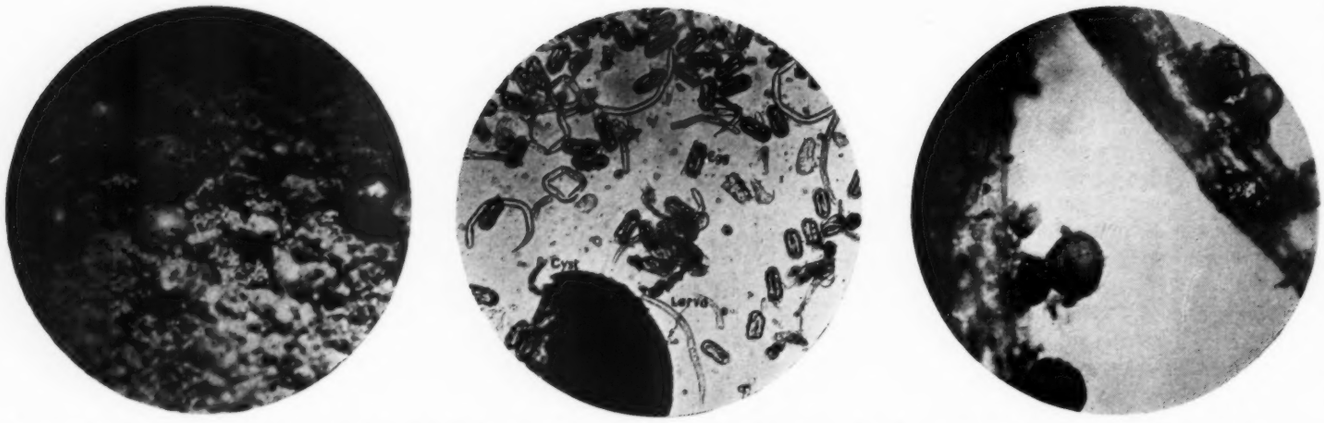

Fig. 2.—The potato root eelworm and its life cycle. *(Left)* **Cysts lying free in the soil, able to attack a potato crop.** *(Centre)* **Under the stimulus of excretions from the roots of potato the contents of a cyst become active; eggs hatch into larvae which migrate towards the roots and attack them. Part of a cyst deliberately broken open is shown in the lower part of the illustration.** *(Right)* **The female eelworms, after pairing, make their way to the surface of potato roots and become new cysts full of eggs. These fall from the roots into the soil when the potatoes are lifted**

canes. The latter, though not subject to attack by potato root eelworm, may nevertheless have been grown in eelworm-infested land and carry the disease on adhering soil.

Potato root eelworm can persist in the soil for periods up to 25 years in west Scotland. This is accomplished without the aid of any wild hosts, and there are indications that the cooler the climate the longer the persistence.

Control

The control of any soil-borne disease is a problem which has still to be solved satisfactorily. The difficulty lies in the very large amount of soil involved—about 1,000 tons in the top 8 in. of soil for every acre. Soil pathogens are generally distributed more or less uniformly throughout the soil mass so that to be effective any agent for control must be capable of reaching every particle in all the 1,000 tons in an acre. This could only be done either by *very* thorough mixing which involves an engineering problem as yet unsolved on a field scale, or by the introduction of a volatile substance, the vapour of which would permeate the soil mass. Soil injectors such as the simplified ' Auchincruive ' gravity-fed machines (Fig. 3)[5] offer a practical method of applying volatile liquids.

Materials for the control of potato root eelworm

A survey has been in progress over several years to find materials suitable for addition to the soil and which would give an economic control of the disease. Table 1 summarises the results of many workers, but this imposing list of substances giving some degree of control does not mean that their use would be economic on a field scale. Most of them, indeed, either do not give sufficient control or are far too expensive, and for practical purposes we need discuss only three of them at the present time. These are mercury compounds, ethylene dibromide and D.D. mixture.

Mercury compounds

These appear to reduce the build-up of the eelworm population while potatoes are being grown. They are all quickly reduced to metallic mercury in the soil[1] and neither mercury nor mercury vapour is known to have any nemacidal action. Mercury vapour appears to exert the observed control through a differential retardation of the growth cycles of host and parasite in a manner similar to that suggested for its fungicidal action by Booer.[2] This unfortunately means in practice that a complete control is scarcely possible—a disappointing conclusion because mercuric chloride at 750 gal. per acre of 1 in 1,000 solution would cost only about £2 10s. per acre for the mercury compound. The amount of water mentioned might well cost more than the mercuric chloride, but the writer's unpublished result with grey powder (finely divided metallic mercury mixed with an inert filler) showed a degree of control equal to that with mercuric chloride solution. The cost of the grey powder would not be more than that of mercuric chloride but very intimate mixing with the soil is required, and this is at present beyond the scope of existing agricultural machinery. Another important feature of the use of mercuric chloride is that there is at present no evidence of any control in the absence of a potato crop, so that no long-term control through the rotation would seem possible.

Ethylene dibromide

The writer obtained some control of potato root eelworm with this substance in 1951, but then considered its use to be quite uneconomic. Recent changes in manufacturing methods, however, have lowered the price considerably, and a revaluation of its use on a field scale is at present being made. It appears to reduce the build-up of the eelworm population when potatoes are grown in infested soil, and it is not yet known whether it has any long-term action in the absence of the crop.

D.D. mixture

This is a mixture of dichloropropane and dichloropropylene, the latter being the active eelworm-controlling agent. It is a dark brown liquid with a characteristic smell, moderately volatile, inflammable and must in use be kept away from the skin, particularly the nose and eyes. Its volatility makes for easy application by means of soil injectors and its method of action brings certain advantages in the control of potato root eelworm.

As a result of our work at Auchincruive we have come to the conclusion that it has a three fold action:

(1) It can kill larvae directly.

(2) It can stimulate eggs to hatch in the absence of a potato crop.

(3) It can, under certain conditions, stimulate the growth of the potato crop.

The degree of control obtained by the use of D.D. will depend on the most intelligent use being made of these three actions. Evidence for the first two types of action can be obtained by comparing the number of eggs and larvae within cysts from treated plots with those from controls

(Fig. 4). It will be seen that the numbers of live larvae and of full eggs are significantly lower in cysts from the treated plots than they are in the controls. Earlier work by the writer[4] also included results which suggested that D.D. could stimulate the hatching of eggs in the cyst in the absence of a potato crop. Evidence for the direct stimulation of potato growth is given in Fig. 5, while the results of experiments on the direct effect of D.D. on potatoes and other crops are summarised in Table 2. It should, however, be realised that if almost any crop is planted immediately after the injection of D.D. there is an initial check to growth. Stimulation only comes later, presumably when diffusion from the injection points has reduced the concentration to non-deleterious levels.

An important factor in successful treatment is that applications of D.D. should be so timed that they exert their maximum effect. Treatments of first-early crops grown year after year as mentioned for Ayrshire, are given immediately after one crop is lifted in order to benefit the next. For second-earlies not grown in a long rotation, it is best to give treatment two or even three years before the crop. The effect of D.D. in controlling potato root eelworm on late crops is not yet known, but it is already obvious that treatments must be considered in relation to the seven-year rotation usually practised for this crop. Long-term experiments involving two applications are now in progress. The general plan is to inject initially 200 lb. of D.D. per acre immediately after one potato crop is lifted. This is designed to kill off any larvae within the cyst and to start the wasteful hatching of eggs in the absence of potatoes. A second application is planned to be given some 12 to 18 months before the second potato crop is to be grown. This is intended to continue the killing of larvae, and the hatching of any eggs which may be left, and there would also be sufficient D.D. left in the soil to stimulate directly the growth of the potato crop when it is planted. If any *complete* control of potato root eelworm is possible on main crops it would, on present knowledge, seem most likely of attainment by long-term treatments such as that suggested.

TABLE 1

MATERIALS INVESTIGATED FOR THE CONTROL OF POTATO ROOT EELWORM

Negative	*Positive in some degree*
Sulphur, naphthalene, artificial fertilisers[8]	Calcium cyanide, carbon disulphide[12]
Iron powder, zinc oxide [10]	Potassium ethyl xanthate, chinosol (economically prohibitive)[9]
p-hydroxyphenyl isothiocyanate, O-tolyl isothiocyanate, p-tolyl isothiocyanate[15]	Calcium cyanamide[8]
Chlorphenol in aqueous solution[16]	Ferrous sulphate, ferric chloride, ferric oxide[9]
Phenol-oil emulsion, potassium permanganate, sodium hypochlorite, isopropyl phenyl carbamate, benzene hexachloride (Gammexane), cetyl trimethyl ammonium bromide[4]	Calcium cyanamide and pyroligneous acid combined[7]
	Chloro-acetates[14]
	Phenyl isothiocyanate, ethyl isothiocyanate, n-butyl isothiocyanate[15]
	Allyl isothiocyanate (mustard oil)[3]
	'Solubilised' phenols, cresols and xylenols (and also chlorinated compounds of these)[16]
	Mercuric chloride[11, 4]
	Organic compounds of mercury (tolyl mercury acetate and ethyl mercury chloride)[1]
	Metallic mercury (grey powder): Grainger, unpublished
	Tar acid fractions, ethylene dibromide, methyl bromide[4]
	D.D. (dichloropropane-dichloropropylene mixture)[13, 4]
	Parathion, chloropicrin

The relative effects of D.D. eelworm control and of plant stimulation

The results of numerous experiments with first-early potatoes are averaged in Fig. 5. D.D. persists in the soil for about a year after applications at 200 lb. and less per acre, nearly two years at 400 lb. per acre and more than two years at 800 lb. per acre. It was noticed that when D.D. was likely to have persisted in this way, increases in yield were greater than those obtained when the D.D. had evaporated, although the degree of eelworm control remained the same. The differences in yield are presumably due to direct stimulation of the crop and they agree fairly well with the maximum increases recorded for potatoes when no eelworm is present (Table 2). An opportunity to test this view occurred when co-operative experiments with Dr. J. W. Robson of Plant Protection Ltd. were being carried out with Parathion as a means of control. This substance appears to control the eelworm population without affecting growth of the host plant, and the increases in yield are similar to those after D.D. has evaporated from the soil. When treatment with D.D. at 200 lb. or 400 lb. per acre is given one year before the crop it is to benefit, direct stimulation has a relatively big effect and accounts for most of the increase in yield. The amount of stimulation is still considerable in treatments given two years before the crop, but in treatments given three years before it is almost non-existent, and the increases in yield, which may reach 30%, are due almost entirely to the control of eelworm while the D.D. was still there.

The stimulating effect of D.D. upon a crop cannot be the result of any direct manurial action. It might well be, however, that of partial sterilisation causing a liberation of nitrogen from protein organic matter in the soil. Many field observations do, indeed, support this view. Italian ryegrass, for instance, sown after treatment with D.D., usually has darker green

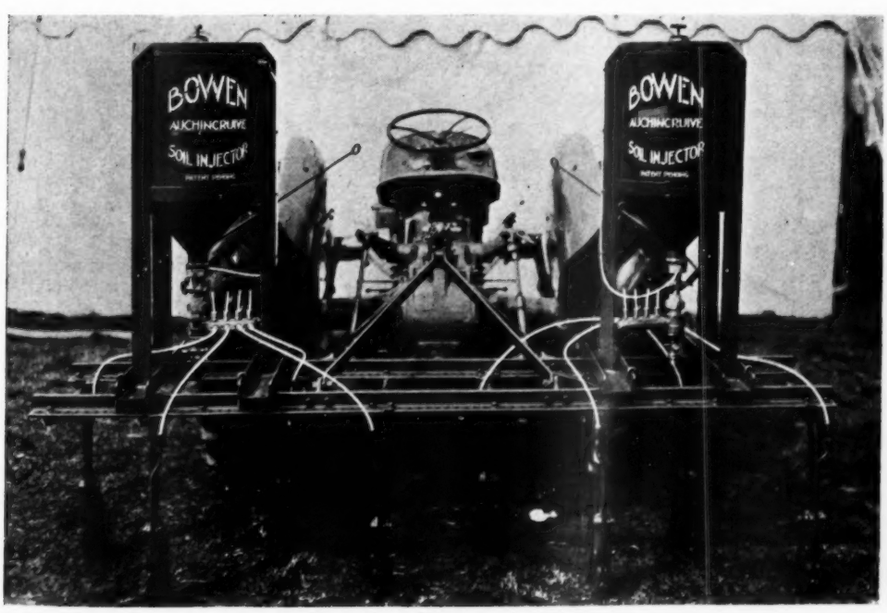

Fig. 3.—Two units of the Bowen 'Auchincruive' soil injector mounted on a cultivator toolbar. The liquid is delivered to the bottom of an open furrow immediately before the next slice is turned upon it

foliage than on untreated plots, and the crop is frequently laid on the treated areas, while it is not laid on land without D.D. If this view is correct, the degree of crop stimulation obtained from D.D. should depend on the amount of organic matter in the soil available to be broken down to ammonia and nitrate nitrogen. This might account for the rather variable behaviour of the potato crop recorded in Table 2. The lack of any increase in the second year after injection (400 lb., 1953, in Table 2), for instance, was found on land with only 7% of organic matter.

There is, however, an interesting alternative explanation of crop stimulation advanced by Steiner,[17] 'the so-called stimulation of crops produced by nemacidal soil fumigants may frequently be the result of an ignored control of multiple infections and mixed populations [of other eelworms] instead of that of the single infection and pure population assumed by the experimenter.' This view cannot be ignored, though our own work in Scotland would seem to be more in favour of the explanation by partial sterilisation. More work is needed.

Economics on first-early crops of Epicure potatoes

It was stated earlier[4] that the total increases in yield over a period of three years following one application of D.D. were worth about twice the cost of the control material, whether the applications were made at 200 lb. or 400 lb. per acre. This was at prices ranging from £28 to £42 per ton for the first-early crop. Subsequent results have given little cause to alter this view. Treatments have now indeed been given commercially for two seasons, and a cost of £3 per acre has been charged for injection if done by contract. When this cost is added to that of the D.D. the average results shown in Table 3 are obtained and still show a reasonable profit on the transaction.

Considerable interest attaches to the possibility of giving continued yearly applications on first-early ground. Our first attempt to assess this was frustrated by an otherwise laudable decision of the farmer to rest his first-early land from potatoes for a year. New experiments have, however, been set up, and it may be possible in the future to carry these forward to a successful conclusion. The present indications are that the eelworm population was diminishing progressively year by year and the yield increase was gradually mounting towards the expected 40%. It may also be significant that under glasshouse conditions a very light attack of potato root eelworm on tomato appears to have been controlled entirely by two applications of D.D. at 400 lb. per acre.

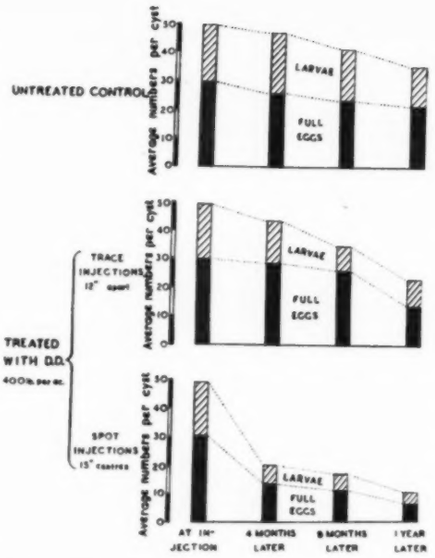

Fig. 4.—Changes in the numbers of full eggs and live larvae within cysts, following injection with D.D., and in untreated controls

Economics and difficulties on second-early Epicure crops

The average increase in yield from three recent series of experiments on second-early Epicure crops is 1.2 tons per acre. These potatoes, lifted in July, command a price of about £15 per ton so that the value of the increased produce is worth £18. This exactly equals the cost of treatment (£15 for 200 lb. of D.D. plus £3 as the cost of injection per acre). There is no margin of profit and as these second-earlies are usually grown in a short rotation there is no residual control value on the subsequent crop.

There is, moreover, another difficulty with second-earlies. Fig. 6 (republished from an earlier publication[6]) shows that the eelworm population must be brought below a certain value round .8 cysts per g. of soil before any real control of the disease is obtained. It was mentioned above that eelworm populations are heavier than those with first earlies. If, therefore, the original infestation was high—around 4 cysts per g. of soil—and was diminished by 75% as a result of treatment, it would still bring the eelworm population into the region of greatest increase when potatoes are grown. This would do away entirely with any increase in crop, and in one experiment this state of affairs was actually found. The average yield on the control plots was 10.38 tons per acre and was only 10.14 tons per acre on the plots treated with 200 lb. of D.D. per acre two years before the crop. This is an additional complication but it would seem that advisory services would be able to forecast when treatments are likely to be ineffective.

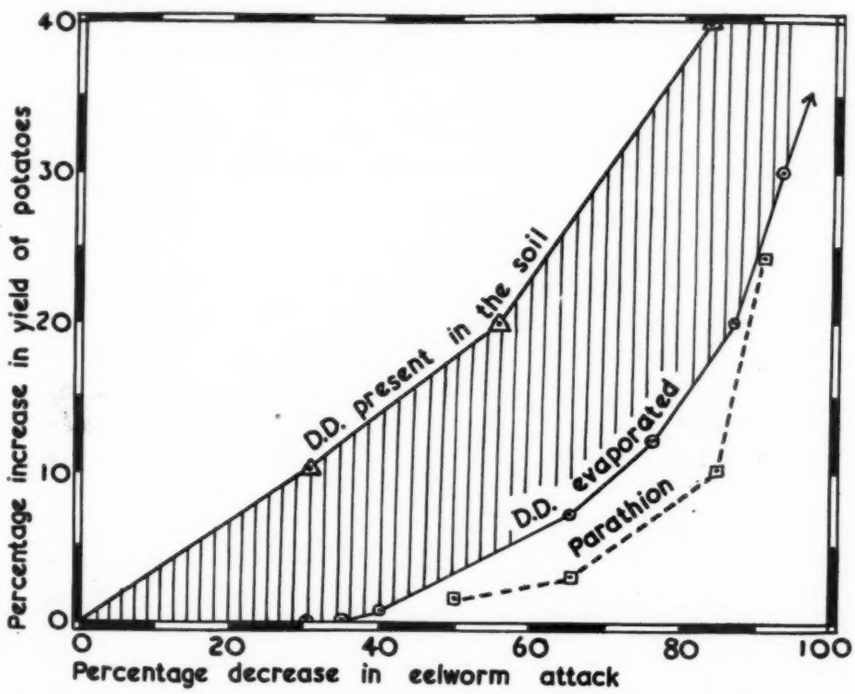

Fig. 5.—Increases in yields of the early potato crop compared with decrease in eelworm attack measured as cysts per inch on the roots. The shaded area shows the greater increase in yield when D.D. is actually present in the soil

Progress of long-term experiments with main-crop potatoes

Soils from a typical long-term experiment based on the rotational treatment over seven years mentioned above were examined 17 months after the injection (Table 4). Average numbers of full eggs and of live larvae per cyst were significantly lower in the treated plots than on the untreated, and so far the treatment is going according to plan. There is as yet little difference between treatment at 200 lb. per acre and at 400 lb., and cysts from control plots have lost rather more contents than usual. It still remains to be seen whether sufficient control will be obtained at the end of the seven-year rotation.

Long-term treatments raise the question as to the effect of D.D. on crops other than potatoes. Table 2 gives the information so far available. The particular rotation of these long-term experiments is: potatoes, oats, sown out with grass, which remains for four years and is then ploughed out for oats before the next crop of potatoes. It is fortunate that the oat crop seems to be particularly stimulated by D.D.—even more than potatoes. The only serious deleterious effect of D.D. upon crop yield is that of carrots in 1952. These were indeed sown immediately after the D.D. was applied, and tomatoes and daffodils are known to be damaged by high initial concentrations of D.D. An interval of at least three weeks separated treatment and the sowing of carrots in 1953, and here there was less damage. The general conclusion seems to emerge that unless applications of D.D. are given immediately before sowing or planting, little damage and some possible benefit may be experienced on a wide variety of crops as a result of the treatment.

The improvement of injection technique

An early experiment in 1947 compared the injection of the same weight of D.D. per acre with injection traces spaced at 9 in. and 12 in. The yield figures showed a slight increase in favour of the 12 in. spacing (Table 5). The differences were not significant and little more was thought about the result at the time. In 1950-52, however, another rather unexpected result occurred which also suggested the same fact. The top half of a large experiment was cross cultivated deeply immediately after injection with a view to disturbing the injection traces under the soil. The results (Fig. 7) show that the expected increases in yield were obtained only from the plots on which the injection had not been disturbed. Control of the eelworm population was also poorer on the disturbed plots

TABLE 2

THE EFFECT OF D.D. ON CROP YIELDS IN THE ABSENCE OF POTATO ROOT EELWORM

Rates of application per acre	*First year after treatment*			*Second year after treatment*
	200 *lb.* (1953)	400 *lb.* (1952)	600 *lb.* (1953)	400 *lb.* (1953)
Potatoes:				
Arran Pilot	+ 13.1%	+ 25.6%	+ 12.1%	— 5.0%
Dunbar Rover	—	—	+ 4.2%	± 0%
Kerr's Pink	—	—	+ 1.7%	— 3.9%
Oats	+ 32.0%	+ 27.0%	+ 7.1%	+ 15.0%
Barley	— 2.5%	—	+ 12.2%	—
Wheat	+ 16.0%	—	+ 8.0%	+ 7.0%
Beans	—	— 3.7%	+ 2.2%	— 2.6%
Peas	—	— 6.0%	—	—
Carrots	— 13.2%	— 35.0%	— 15.4%	— 19.0%
Turnips	+ 17.0%	+ 20.0%	+ 7.6%	+ 17.2%
Cabbage	+ 24.5%	—	+ 31.4%	— 5.7%
Cauliflower	—	+ 50.0%	—	—
Lettuce	+ 21.4%	—	± 0%	— 6.7%
Sugar beet	—	—	+ 18.0%	+ 11.7%

TABLE 3

ECONOMICS OF TREATMENT WITH D.D. ON FIRST-EARLY EPICURE POTATOES

	Increases in yield, tons per acre						*Value of total produce**	*Costs of D.D. plus injection*
	1st crop	*2nd* crop	*3rd* crop	*4th* crop	*5th* crop	*Total*		
							£ s.	£
Single treatments (given one year before the 1st crop, at 200 lb. per acre):								
I	.39	.65	.37	†	—	1.41	45 1	18
II	1.07	†	.41	0	—	1.48	34 8	18
III	.28	1.06	0	0	—	1.34	34 17	18
							114 6	54
Single treatments (given one year before the 1st crop, at 400 lb. per acre):								
I	.92	.82	.12	†	—	1.86	54 14	33
II	.54	†	.86	0	—	1.40	44 18	33
III	.91	1.36	.99	0	—	3.26	100 12	33
							200 4	99
Three consecutive treatments (given one year before the 1st, 2nd and 3rd crops):								
I 200 lb. per acre	.39	1.17	.79	†	.31	2.66	86 11	54
I 400 lb. per acre	.92	1.70	1.69	†	.61	4.92	163 12	99

* Values of potatoes per ton at the times of lifting were:

	1st crop	*2nd crop*	*3rd crop*	*4th crop*	*5th crop*
I	£29	£28	£42	—	£30
II	£16 5s.	—	£42	—	£30
III	£26	£26	£42	—	£30

† Not in potatoes.

TABLE 4

COMPARATIVE NUMBERS OF EGGS AND LARVAE IN LONG-TERM EXPERIMENTS ON MAIN CROP POTATOES

	Average number of full eggs per cyst	*Average number of live larvae per cyst*
At injection (October 2, 1951)	51.2	41.2
Seventeen months after injection (March 9, 1953):		
Control	23.6	19.9
200 lb. D.D.	17.0	12.8
400 lb. D.D.	17.8	12.8

TABLE 5

AVERAGE YIELDS FROM 9-IN. AND 12-IN. INJECTION SPACINGS, FIRST-EARLY EPICURE CROP, 1947

Rate of application of D.D. per acre	200 lb.		400 lb.	
Spacing	9-in.	12-in.	9-in.	12-in.
Yield, equivalent to tons per acre	6.66	7.14	6.96	7.90
Yield increases over control yield of 6.51 tons per acre	.15	.63	.45	1.39

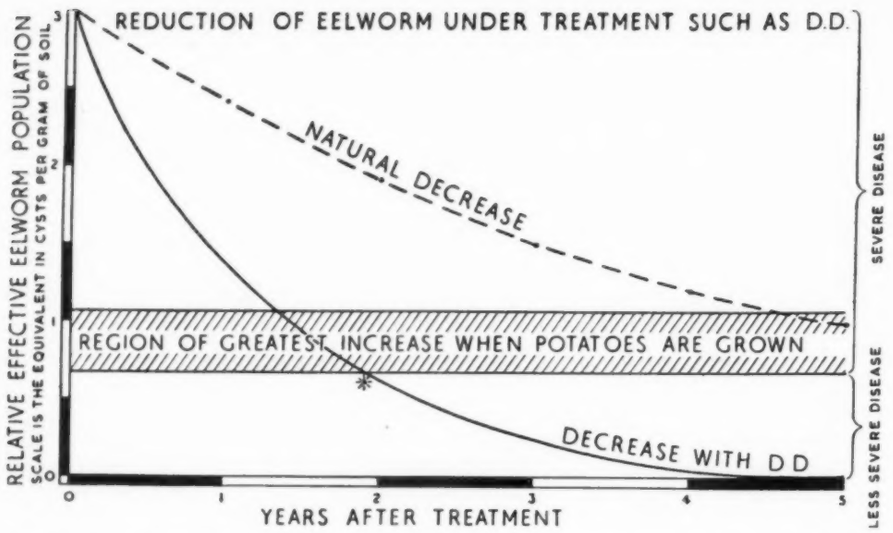
REDUCTION OF EELWORM UNDER TREATMENT SUCH AS D.D.
NATURAL DECREASE
REGION OF GREATEST INCREASE WHEN POTATOES ARE GROWN
DECREASE WITH D D
RELATIVE EFFECTIVE EELWORM POPULATION
SCALE IS THE EQUIVALENT IN CYSTS PER GRAM OF SOIL
YEARS AFTER TREATMENT
SEVERE DISEASE
LESS SEVERE DISEASE

Fig. 6.—Showing the increased rate of reduction of eelworm population following treatment with D.D. Control is only obtained when the population falls below the point marked *

than on the undisturbed ones (Fig. 7). There is *some* control of the parasite, but from other experimental evidence it would seem that no increase in yield can be expected until more than 40% control of the eelworm population is obtained. Fig. 7 also suggests that undisturbed treatments at 50 lb. and 100 lb. per acre bring such small increases in yield as to be worthless in practice.

Both the experimental results mentioned above, when taken together, seemed to indicate that, within limits, the more D.D. is concentrated in the soil the better is its performance. The obvious further step was to test out the relative efficacy of ' spot ' *versus* ' trace ' injections for equal quantities per acre. Results from such an experiment are given in Fig. 4 and show the superiority of the ' spot ' method of injection. The ' spots ' were spaced at 15 in. centres and were given by means of a hand gun as in greenhouse practice. The ' trace ' injections were spaced 12 in. apart.

All three results point directly to the need for some mechanism for ' spot ' injection on a field scale and work is already in progress to design a suitable interrupter to work with the ' Auchincruive ' gravity-fed soil injector.

Conclusion

The use of D.D. for the field control of potato root eelworm would therefore appear promising on the whole. This substance appears, moreover, to have certain advantages not possessed by other nemacides which have been used on a field scale up to the present. Its greatest disadvantage is, of course, its relatively high cost. This

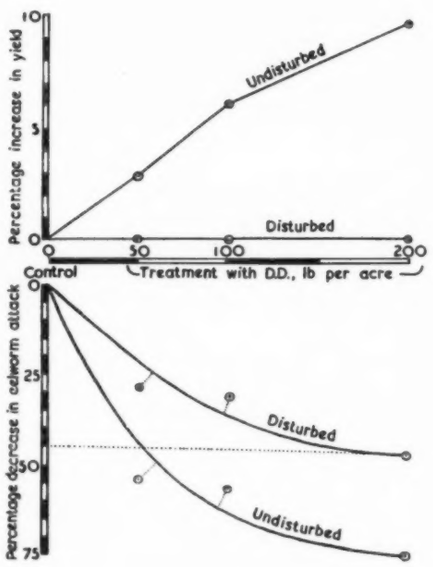

Fig. 7.—Comparisons of yield (*above*) and of eelworm control (*below*) between disturbed and undisturbed injections for different rates of application of D.D.

is particularly felt in Europe since D.D. is at present produced only in America, and its purchase involves a dollar problem. There is, therefore, in addition to the pathological and engineering studies an urgent need for administrative, economic and commercial approaches which would create such a demand for D.D. on this side of the Atlantic that it could be manufactured over here. This raises a problem which cannot be resolved by research work alone and is a good example of the breadth of vision required in solving new problems in agriculture.

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Photos : West of Scotland Agricultural College.
Fig. 6 : British Agricultural Bulletin.

The Late Noel Deer

The passing, in September last, of Noel Deer at the age of 79 leaves the cane sugar industry the poorer by the loss of one who, in his time, occupied a commanding position among sugar experts. Indeed, it can be truly said that the year 1953 was memorable for the demise of two men who left a permanent mark on the sugar industry, *viz.*, Noel Deer and Prinsen Geerligs.

Noel Deer, during a lengthy career, served in many lands where cane sugar is grown, including Mauritius, British Guiana, Hawaii, Cuba, the United States and India, in every one of which he left his mark on the sugar industry, particularly in India where, as administrator to one of the large sugar companies, he was responsible for the design and erection of a number of modern sugar factories.

It is, however, by his books that he will best be remembered, the earliest of which, ' Sugar and the Sugar Cane,' appeared in 1905. This was succeeded by his monumental work ' Cane Sugar,' of which the first edition appeared in 1911 and the second in 1921; in it he traversed with success all aspects of sugar production, including both the agriculture of the sugar cane and the manufacture of sugar. His last work was a ' History of Sugar ' in two volumes, published in 1949-50, in which he traced the history and development of both the cane and beet sugar industries in the various parts of the world in which sugar is grown.

He will also be long remembered for his many notable contributions to the chemical side of sugar factory control. Taken by and large it can be said that he was noted for his unremitting industry and for his vast knowledge of all aspects of sugar production; his memory will long be held in respect as one to whom the industry owes a considerable debt.

The Smithfield and Agricultural Machinery Show

THE 1953 'Smithfield' opened its doors at 9 a.m. on Monday, December 7, and continued its customary five-day run until the afternoon of Friday, December 11, when the exhibition terminated.

This year the show was on the lines which have been customary since the war and combined the exhibition of fat stock, which has made the name of the Smithfield Show famous throughout the years, and the collection of farm machinery and implements, which has already achieved an equal meed of fame not only in the United Kingdom but throughout the world.

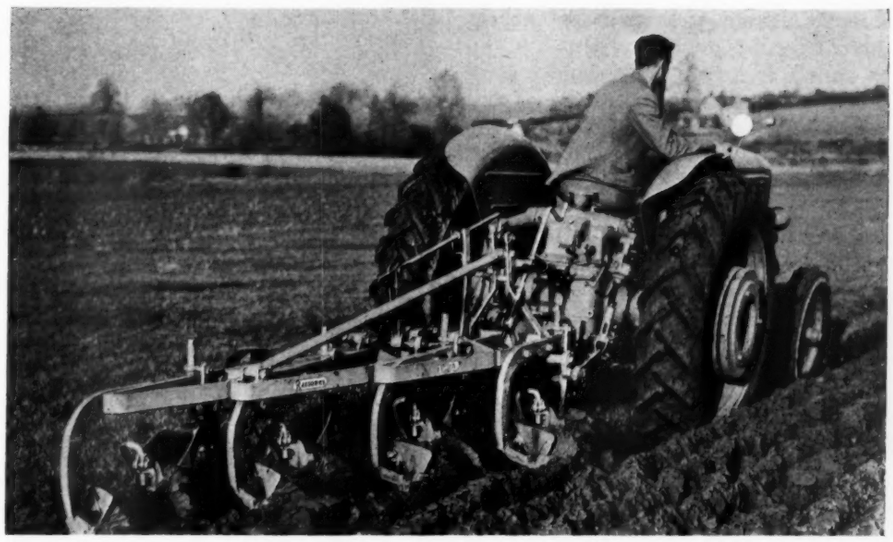
Some people may still consider that this marriage of machinery and livestock is perhaps not naturally well assorted, but, if attendances and exhibits are any guide, such a view is definitely negatived by the triumphant success which the shows in this form have achieved. However, it seems within the bounds of legitimate speculation to wonder how long this association is likely to continue, inasmuch as the natural growth of one or both its constituents seems not unlikely, eventually, to lead to its break up simply from the physical inability of finding one site which conveniently can contain them both.

Be this as it may, from both aspects this year's show must be accounted once more to have been a triumphant success. Attendances were high throughout the show, exceeding the totals from the previous year. Visitors included a large number from overseas. Machinery exhibitors are reported to have booked a satisfactory number of orders, including many for overseas countries.

In all, 1,250 exhibits of live animals appeared on this occasion, including some 352 cattle, 489 sheep and 408 pigs with, in addition, about 370 entries in the special carcase section. The high quality of the exhibits in all these sections provided hopeful auguries for the home-killed meat supplies. This year the animal sections were happily less handicapped by the foot-and-mouth disease precautions which proved a difficulty last year.

Machinery and Equipment

A new F.R. four-furrow mounted plough for use with the Fordson Major has been designed, and was shown at the Smithfield for the first time by the **Ford Motor Co. Ltd.** Important design points, such as the weight to be lifted hydraulically and the effect of a heavier implement on tractor stability have been taken into consideration, and both tractor and plough have been subjected to field tests under a variety of conditions. The new plough is designed for fixed four-furrow work and is offered in two models, the TS.70 (fixed 10 in.) and the TS. 71 (fixed 12 in.). The frame has been designed to withstand loads imposed in four-furrow work but is sufficiently light to come within the lifting capacity of the hydraulic pump. The 10-in. plough will be fitted with general purpose or semi-digger bodies. The semi-digger body only will be fitted for 12 in. wide work. Disc coulters of the fork type with 14 in. diam. discs and skim attachments are standard equipment. Depth control will be by a screw-operated disc type land wheel and the front furrow width can be varied from the tractor seat by means of a screw-operated cross shaft.



The new F.R. four-furrow mounted plough at work on medium loam land in Essex

The stand of **Burt Boulton and Haywood Ltd.** was designed to give practical guidance to the farmer in the identification of the pests attacking his crops so that the correct methods of control can be exercised. Technical staff were in attendance to give information on the company's range of insecticides, fungicides and weed killers.

The **Electrical Development Association** exhibit drew attention to the application of electricity to the drying, conveying and storing of grain, including in-silo drying and storage and in-sack platform drying. A striking feature was a 20-hole platform type in-sack electric grain drying installation. Another exhibit consisted of a 60-ton in-silo grain drying and storage plant.

Among the wide range of equipment shown by **Ransomes Sims and Jeffries Ltd.** was the new, improved MG6 tractor which is said to have all the features required to make market gardening or fruit farming more profitable. Ransomes TS65 and TS66 ploughs are included in the extensive range of implements for use with tractor fitted with hydraulic lift and linkage.

The stand of **Geo. W. King Ltd.** was largely devoted to pneumatic grain handling and storage equipment. A comprehensive range of King cyclonic equipment was available for inspection, together with working models. Exhibits also included diesel thermatic grain conveying and drying equipment which makes use of the waste heat derived from exhaust and cooling systems of a diesel engine. Among other exhibits, the company showed tubular steel cowstalls, bull pen equipment, automatic drinking bowls and various pulley blocks.

Two Birmingham firms co-operated to produce a new rotary cultivator which was on show. It is made by **Clifford Aero and Auto Ltd.** and driven by a B.S.A. power unit. The 500 c.c. engine, known as the 'PUM 20,' is also new, being the latest addition to the **B.S.A. Company's** range of power units. The controls of the new machine are brought together so that all are within easy reach of the operating handlebars. These can be swung to either side and are adjustable for height. Reverse is engaged from the handlebar and automatically disengages on release of the handle grip. Depth of cultivation is 9 in. under most conditions of market garden work and width 22 in. The engine, tank and gearbox are housed under a streamlined weather cowl which is hinged to allow access to the filler caps, etc.

Among the machines shown by **Steel Fabricators (Cardiff) Ltd.** was the 'Brinkworth' dual purpose loader and stacker. It will pick up bales or bags direct from the ground and load them on to a truck or trailer. By a simple operation with a hand winch the machine is converted into an elevator which will lift bales or bags to heights of 16 ft. and over, dependent on the type of tractor or vehicle it is fitted to. It can be adjusted to suit any make of truck or tractor. The company also exhibited the 'Horn' shredder, a machine which is said to make a clean blanket sweep, shredding and levelling stalks and weeds. It has free-swinging, reversible hammers, three separate shredding heads ensuring positive shredding, spring-suspended frame, V-belt drive, three self-aligning shafts, low shields at the sides. Baffle plates in the hood deflect large pieces of stalk back into the cutting heads.

The **Wolseley Sheep Shearing Machine Co. Ltd.** showed a wide range of implements for the first time. Among them was an adjustable tool chuck which can be fitted to the flexible shaft on Wolseley clipping and shearing machines. The chuck can be used for drilling, sanding and grinding. The company also showed the New Wolseley Reel Strainer. This reel and strainer combined for use in conjunction with the electric fence enables the user to carry up to 200 yds. of seven-strand mild steel wire on the reel which is attached to the company's standard end tripod. In operation, the wire fence can be erected in the normal way by unwinding the wire from the reel to the length desired, and when it is has been secured both ends the whole fence can be tensioned by tightening the wire on the reel. No separate strainer is required.

Among the equipment shown by **Kenneth Hudson and Son** was the Hudson-Colquhoun mounted tractor capstan which has been designed for awkward farm jobs such as lifting heavy sacks, tightening slack wire and many other similar jobs. The machine can be easily fitted horizontally or vertically to the p.t.o. on most tractors, and can be used at the same time as the hydraulic linkage pick-up hook, etc., and need only be dismounted if one of the p.t.o.-operated implements are used. Also exhibited by this company was the two-disc mounted plough which has been specially developed for the smaller wheel tractors fitted with the three-point hydraulic linkage.

Dashwood Engineering Ltd. exhibited a new machine—Model C. This is an innovation, as previously the makers have specialised in single-wheel machines. This model, powered by a four-stroke engine, has roller-chain transmission working via a special two forward speed gearbox and is offered in the three distinct forms for which it has been designed: (*a*) As a rotary hoe. The rotor unit, being quickly detachable, is 15 in. overall and cuts almost 12 in. to an average depth of 6 in. (*b*) As a motor scythe. The 3 ft. cutter bar supplied is said to have the working mechanism adequately guarded, and that it can be cut out at will by the operator without stopping the engine. (*c*) As a hoe and cultivator. The standard equipment comprises a 15 in. toolbar, a pair of 8 in. hoes and a set of four cultivators. Manually operated ratchets are fitted to the wheels, the handlebars can be swung from side to side and particular care has been taken to keep the machine as narrow in width as possible. The minimum width is 15 in., which can be increased to 21 in. by reversing the wheels, while the ground clearance is 7 in. A ploughing attachment will also be available.

The Clifford Aero rotary cultivator, powered by a new B.S.A. unit

A Massey-Harris No. 780 combine fitted with M-H Raussendorf straw press harvesting a tangled crop of oats in Bedfordshire

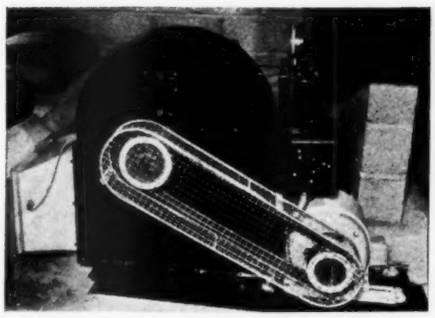
A wide range was shown by **Drake and Fletcher Ltd.** Among the new developments was a general purpose loader designed to handle boxes, sacks, etc., for farm and industrial use. The new model of the Mistifier knapsack sprayer features the plastic inner bag which contains the liquid. The air is contained in the space between the bag and the light metal canister so that no corrosion takes place and liquid does not come in contact with the metal canister, relief valve or pressure gauge. Another new development, the 'Cob' platform grain dryer, consists of an oil burner with fan unit which has been designed to enable every farmer to carry out the drying of grain on his own premises at reasonable cost.

Denings of Chard Ltd. also showed a wide range of equipment which included 'Somerset' disc harrows, grain and fertiliser drill, potato spinner, haysweep and side delivery rake and swath turner. The 'Somerset' N.E.W. stationary saw bench has been specially adapted for agricultural use. Built to stand vigorous treatment with steel frame, steel table top, large size saw spindle, it is said that it can tackle any woodcutting job on the farm up to the size of saw supplied.

The range of equipment of **Massey-Harris Ltd.** and **Harry Ferguson Ltd.** were seen side by side. Together, the two stands exhibited machines for ploughing, cultivating, sowing, harvesting, transporting and for all mechanical operations normally carried out on the farm. A new Ferguson medium pressure sprayer made its first appearance, this machine being distinct from the Ferguson low volume sprayer in that it has been designed for both low and medium-to-high volume pest and weed spraying. The sprayer is three-point linkage mounted. The Massey-Harris exhibits included the No. 780 self-propelled combine harvester with Raussendorf straw press, Perkins L.4 diesel engine and new Massey-Harris all-purpose reel.

Among the items exhibited by Stanhay (Ashford) Ltd. (**S. Berendsen Ltd.** acts as the export department) was the Stanhay seed spacing drill which has been tested by the sugar beet producers' associations in practically all the beet producing countries. Reports are said to be favourable. The company also showed the Darvill Stanhay retractable wheel strakes.

Shown for the first time at Smithfield by the **International Harvester Co. of Great Britain Ltd.** was the recently introduced International 'BTD-6' crawler tractor. This is a full track model, its units throughout, including the transmission, being designed exclusively for crawler work. The company also showed the new ' Weedall ' sprayer which has a capacity of 60 gal. The effective working width is 19 ft. 6 in.



The ' Cob ' platform grain drier, made by Drake and Fletcher

Among the machines showed by the **Dorman Sprayer Co. Ltd.** were two new models—the Dorman 150-gal. saddle tank low/medium volume tractor mounted sprayer and the Dorman 40-gal. tractor mounted low volume sprayer. The former has two 75 gal. tanks which are fitted on either side of the engine, and each tank is complete with close fitting lid and filter basket. The 30 ft. booms are rear mounted and nozzles are set at 18 in. centres. They are vertically and laterally sprung to prevent damage through excessive vibration or should an obstruction be met, and wheels are mounted on the ends to prevent damage should the boom strike the ground. The unit is fitted with a $1\frac{1}{4}$ in. gear pump, which is direct coupled to the tractor p.t.o. with flexible coupling. Boom height adjustment is available between 18 and 44 in. Applications range from 5 to 50 gal. per acre.

The Hudson two-furrow disc plough

The 40-gal. sprayer has a circular drum tank, generally similar in design as the 20-gal. sprayer tank, it is internally treated against scaling and corrosion and is supplied complete with a filtered filling funnel. The unit has a $\frac{1}{2}$ in. gear type pump, direct coupled to tractor p.t.o. The spray-boom is in two sections which are designed to fold upwards for ease of travel and sprung laterally to obviate damage when meeting an obstruction.

Cooper, Pegler and Co. Ltd. showed many of its spraying and dusting machines, and certain new models which included the ' Eclair ' tractor mounted low volume sprayer. Fitted with a brass tank and a substantially modified chassis and spray broom, this sprayer now has a powerful diaphragm pump. Another development is the hand power low volume weed sprayer for mounting on any farm cart, float, etc. The company also showed the ' Toxaver,' a small compact power duster mounted either on a stretcher or wheel-barrow type chassis, and the ' Rex ' 2-3-4 jet lance for weed spraying.

A wide range of farm machinery and cowhouse equipment was shown by **Salopian Engineers Ltd.,** including a new attachment which has been introduced for use with the Salopian ' Evenspreader ' and the ' Quickspreader ' to enable pig or semi-liquid manures to be spread evenly and economically. Another innovation on the ' Quickspreader ' manure spreaders is a drawbar designed to fit the hook type coupling for quick hitching and unhitching of the spreader, which can be accomplished without the tractor driver leaving his seat.

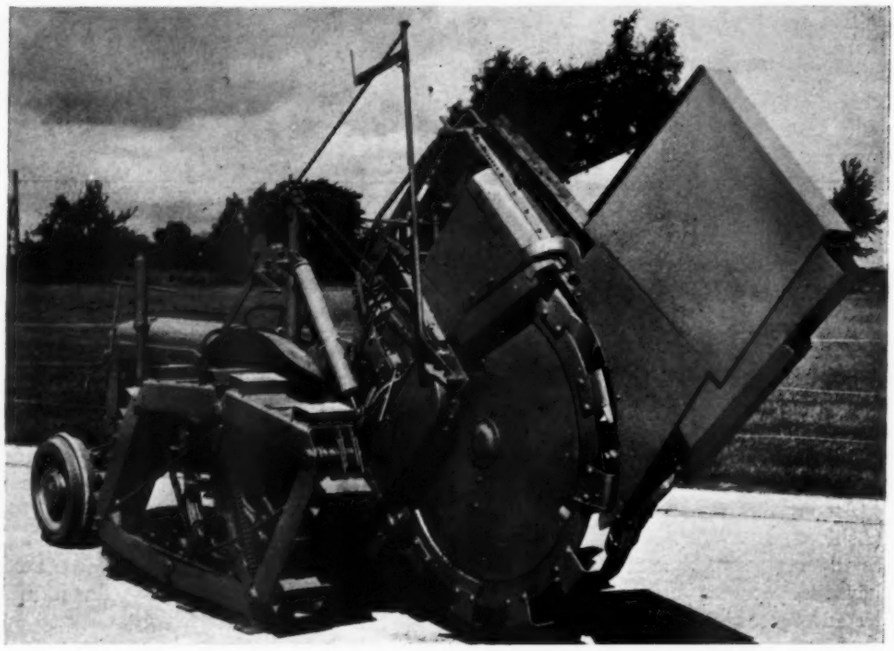
The Genimec twin barrel spray rig was shown by **E. Allman and Co. Ltd.** This is a general field sprayer but is also suitable for spraying bush and standard fruit trees. It was shown as a trailer model but can also be supplied for tractor mounting. A new innovation on this machine is a new roller pump. An entirely new machine was a front mounted distributor for the placing of a ribbon of artificial fertiliser along the side of the plant. This machine, although mounted on the front is lifted by the tractor hydraulic lift and at the same time it leaves the hydraulic lift free for the mounting of another implement.

Among the machines shown by **Jack Olding and Co. Ltd.** was the ' Wilmo 10 ' disc fertiliser distributor. This new model is equipped with a rotating feed box which can be swung round for road transportation, enabling the machine to pass through any normal farm gate. The sowing width is 12 ft. 9 in. and the minimum overall width for road transportation 7 ft. 5 in. The feed box has a capacity of 10 cwt. and

an additional 7 cwt. may be carried on the carriage platform. The patent removable feed discs used on the other Wilmo distributors have been incorporated into this model.

Rotary Hoes Ltd. exhibited the ' Platypus 30 ' crawler tractor which has now been developed into a fully agricultural and industrial tractor. Ancillary equipment now includes an angledozer and a winch. The essential feature of the Howard trailing rotavator is said to be the speed and ease with which it can be fitted to any tractor. Fitting is by a simple pin and clevis to the drawbar, and a splined universal coupling takes the drive from the tractor p.t.o. shaft. The first post-war version of the Howard trench-digger and pipe layer made its appearance at the 1952 show when it was not possible to show the pipe layer attachment. Both pipe layer and trench digger were to be seen this year.

Other exhibits included the Howard Rotavator 'Gem' Series IV, 24 in. model and the Howard ' Bantam ' Series II, 10 in. model.



The Howard trench digger and pipe layer

Wheat in the Venetian Region of Italy

(From our Italian Correspondent)

THANKS to the national, regional and provincial competitions organised last year by the Italian Ministry for Agriculture and Forests, it is now possible to follow the progress of the culture of cereals in Italy and to arrive at some conclusions.

In the Venetian region of Italy, the average output of the farms participating in the competitions was very good and superior to the national average. The result is to be attributed to the Italian plant breeders, who have been able to produce cereal varieties well-suited to the climate and the soils of the region, and to the experts of the inspectorate who, in spite of limited resources, have disseminated information about the best varieties and agricultural techniques.

Among the many varieties of wheat on the market, agriculturists prefer San Pastore, Mara, Impeto, Fiorello, Fortunato, Tevera, O,10, Damiano, Aquila, Freccia and Salto. The first of these, San Pastore, is an excellent variety which can be employed in almost any field and resists rust perfectly; its vigour and its well-developed ears are an index of high yield. Its behaviour is consistently good both in deep loams and on the gravelly soils of the hills where the average yields are, however, lower.

Mara is also a very good wheat for fertile soils but requires considerable manuring and is easily attacked by rust; the ears are relatively small and light with a tendency to shatter when harvesting is delayed. Straw is liable to rot in the sheaf, above all if the stalk is still green. The same defect is observed in the O,10 variety.

Impeto is a moderately good wheat which gives a maximum yield of 45 metric quintals per acre. Aquila is employed by farmers to a limited extent; it is particularly suitable for heavy soil. Freccia is also fairly good but needs fertile soils and considerable manuring. Orlandi (O,10) gives high yields but requires very fertile soil and abundant and well-balanced manuring; it is liable to rust and is unsuitable for gravelly soils on the hills.

Fiorello gives good yields and resists rust; Salto is suitable for poor soils and does not require abundant manuring, but its yield is variable. There is a variety employed in the upper part of the hilly and gravelly zones which gives fairly constant yields.

As to the fertilisers, farmers ordinarily employ superphosphate 18/20 (6 to 12 metric quintals per hectare), sulphate of ammonium (1.5 to 3 metric quintals per hectare) and potassic salts 40/42 (1.5 to 3 metric quintals per hectare).

The production of pure seed of wheat is subject to special regulations; those who want to engage in this activity must obtain special authorisation from the Ministry for Agriculture and Forests and allow officers of the Ministry to check the purity of the stands. These wheats are guaranteed pure and sold in bags sealed by the officers of the provincial inspectorate for agriculture and characterised by a special label.

Royal Show, 1954

Certain new proposals for the 1954 Royal Show to be held at Windsor were approved by the Council of the Royal Agricultural Society of England at its meeting on October 7. These include the housing of all cattle and goats in marquees instead of shedding and the removal of any limitation of dairy cattle entries.

The fee for silver medal entries has been reduced from £15 to £10 per entry. A new judge for the silver medal entries will be Mr. Rex Paterson, of ' Hatch Warren,' Cliddesden, Basingstoke, who joins two of last year's judges, Messrs. A. H. Carter and Leslie Langmead, who continue to act in 1954.

In view of the need to encourage the development of a light, cheap and effective form of temporary fencing for sheep, the society will stage a special exhibit on sheep fencing.

There will also be a display of ancient and historical vehicles. Some of these will appear as a ring event similar to that staged at the 1939 Royal Show at Windsor.

Pest Disinfestation Work in the Port of London

W. A. POTTER

Associated Fumigators Ltd.

The work of disinfesting cargoes and ships of predatory pests which take heavy toll of material in course of transit is nowadays recognised as highly important. The following article, contributed by a member of a firm which is actively engaged in this work in the Port of London, is an interesting addition to the article on the work of the Port of London Authority which appeared in our December issue.

OVER the years, the types of vessels using the Port of London have changed, the sailing ship has given way to the coal-burning steamer and, in its turn, to the oil-burner and the motor ship. So, also, pest control work within the port has changed. Our connections with the docks can be traced back some 150 years, but the business was consolidated during the 1914-1918 war and in the years immediately following. Up till 1926 fumigation with sulphur was the accepted means of disposing of the rat population aboard a vessel, but about that time hydrogen cyanide was beginning to be discussed, and indeed the first fumigations with this new fumigant had already been carried out.

De-ratting of ships

Hydrogen cyanide replaced sulphur dioxide to a large degree in the 1920's but today, with continuing progress, many other materials are in general use.

The de-ratting of merchant vessels, under regulations originally formulated at the International Sanitary Convention of Paris in 1926, is now covered by the Public Health (Ships) Regulations, 1952, and if a de-ratting certificate is required the work must be supervised by the Port Health Authority. This certificate remains valid for a period of six months and upon expiry the master of the vessel, or his agents, must request a renewal in the first port the vessel enters that is approved to issue such certificates.

If fumigation is necessary it is normally undertaken in the port, although if returning to a home port the master can request permission to have fumigation deferred until then. After treatment, the vessel is issued with a Port II De-Ratting Certificate.

Hydrogen cyanide fumigation

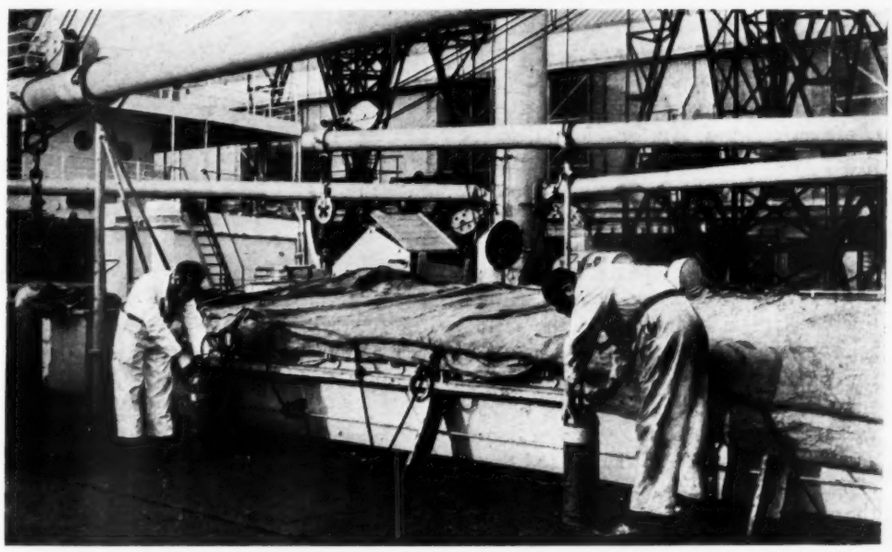
The Hydrogen Cyanide (Fumigation of Ships) Regulations, 1951, apply to all vessels fumigated with hydrogen cyanide in United Kingdom ports.

Fumigation for de-ratting is normally carried out with hydrogen cyanide, employing a dosage of 2 oz. of fumigant per 1,000 cu. ft. of space treated, or with sulphur dioxide, employing 3 lb. of roll sulphur per 1,000 cu. ft. of space treated. Of later years, the use of sulphur dioxide has been almost entirely discontinued at principal United Kingdom ports. In order to secure a certificate it is necessary for a vessel fumigated with hydrogen cyanide to be left under gas for a minimum period of two hours, but experience has shown that the fumigation should never be less than four hours and that in the case of a vessel with exceptional harbourage (*i.e.*, a refrigerated vessel) this time should be extended to a minimum of six hours or preperably to an exposure period approaching 12 to 24 hours. Where rats are known to be behind linings, etc., in accommodation spaces, and particularly in the case of large passenger vessels, the minimum dosage of 2 oz. of fumigant per 1,000 cu. ft. of space although sufficient to secure a certificate is not necessarily adequate to ensure satisfactory fumigation. If possible the dosage should be increased to at least 4 oz. per 1,000 cu. ft. and preferably to 6 oz.

The chief officer of a ship or his deputy is required to attend to the preparation of a vessel for fumigation in the following respects:

All 'tween-deck hatches must be taken off and limber boards lifted. Top hatches must be staggered and covered with at least one good tarpaulin. Refrigerated holds should not be under frost but should be as dry and warm as possible to ensure efficient and normal ventilation. All ventilator covers must be put on or ventilators plugged and goose-necks closed on deck. If engine room and boiler room spaces are being fumigated all covers must be put on and engine room skylights closed down and covered with a tarpaulin if necessary, fires drawn and funnel covered. A check should be made to ensure that no double bottom or oil fuel tank lids are off at the time of fumigation.

Hydrogen cyanide (H.C.N.) is a colourless gas which liquefies at 13.8° C. and boils at 26.1° C. (79° F.); it is normally employed as a liquid that is readily converted into a gas. The liquid can be absorbed in a suitable absorbent material, sprayed under pressure, or introduced into a compressed air stream, the gas then being given off as a fine cloud.



Ship fumigation. Liquid hydrogen cyanide being introduced through a spraying system into the hold of a vessel. The exact weight of gas required is contained in the cylinders to avoid delay on the site

Upon completion of fumigation, tests are carried out to determine that the vessel is free of dangerous concentrations of fumigant, as provided for in the Hydrogen Cyanide Ships' Fumigation Regulations, 1951. Special attention must be paid to peculiarities of construction likely to retain pockets of hydrogen cyanide and temperatures affect the rate of ventilation. Hydrogen cyanide is a protoplasm poison arresting the activity of all forms of living matter and by stopping oxidation vital functions are suspended.

Alternative treatments

From the foregoing it will be seen that fumigation of vessels with hydrogen cyanide is an operation requiring careful planning and preparation. There is no doubt that hydrogen cyanide is a most effective fumigant, but for a long time the desire has been to discover an alternative method that would cause less inconvenience in its application. Of latter years much progress has been made with new rodenticidal poisons, in particular zinc phosphide and warfarin. Now a new chemical, sodium fluoroacetate, is available and the results achieved are such that a Port II De-ratting Certificate can, under suitable circumstances, be obtained in the Port of London when using this material. Sodium fluoroacetate was first used in the United States of America some five or six years ago and the results obtained were most encouraging. Comprehensive experiments and trials were carried out by the Port of London Health Authority over a period of a year or so and the results fully justified the reports received from America. Unfortunately, the manufacture of sodium fluoroacetate can be a dangerous operation and supplies were not available in the United Kingdom. Because of the shortage of dollar currency, importation from the United States was not possible and the use of sodium fluoroacetate in the United Kingdom was held up. During the early part of 1953 Associated Fumigators Ltd. decided to manufacture sodium fluoroacetate and, a satisfactory process having been evolved, the material is now being made and marketed under the registered trade name *Tenate* (pronounced 10-80).

Tenate

The advantages to a shipowner in securing a de-ratting certificate with Tenate rather than with fumigation with hydrogen cyanide are considerable. In particular, there is no loss of working time, the ship does not have to be sealed up and prepared as when using a gaseous fumigant, and it is not necessary to provide shore accommodation for officers and crew during the operation. Tenate is a fine white powder, readily soluble in water, which it does not discolour, has no smell and, as far as is known, has no taste. It is found that rodents will readily take the material either as an aqueous solution or incorporated in a suitable bait. The poison is put down in the sections requiring to be deratted in small polythene baiting cups each of 1 fl. oz. capacity. These cups are placed at strategic points where rodents are likely to run and each section is carefully surveyed in order to be certain of adequate coverage. When rodents emerge seeking for food and water they accept the Tenate and are destroyed.

Tenate is, however, extremely poisonous and its use calls for very careful procedure if accidents are to be avoided. All personnel engaged on an operation must wear rubber gloves, must not smoke or put their hands to their mouths in any other way and any drops of liquid inadvertently spilled must immediately be wiped up and washed down with water. Sections of a vessel being treated must be vacated by all personnel, warning notices placed in position and the chief officer of the vessel advised that entry into the sections will not be allowed until the completion of the operation. All baiting trays are numbered, positions marked and, upon completion, carefully checked out of the vessel. Unused Tenate solution is checked back into a locked store and a record kept of quantities expended.

There is no specific antidote known for Tenate poisoning, which acts upon the heart and nervous system. Death usually results from the effect on the heart. The poison is readily absorbed into the gastro-intestinal tract. Little can be done to prevent progression of cardiac symptoms other than complete rest and administering of a sedative. If not fatal, symptoms of Tenate poisoning will usually subside within a day or so. As will be seen from the foregoing, the use of Tenate is not without hazards and in the United States of America there have been cases of fatal poisoning. Rigid routine and discipline are essential, but given these the risk is less than when using hydrogen cyanide. In the Port of London a considerable proportion of vessels now secure their de-ratting certificates with the use of this material.

De-insection of ships

So far we have dealt with the rodent infestation that is encountered aboard ship, but equally important is the question of insect infestation. Insect infestation can affect the health and well-being of the ship's crew and damage to stores, food cargoes, etc., can reach greater proportions than damage by rodents.

At one time insects could only be dealt with by using contact insecticides or, alternatively, by fumigation with hydrogen cyanide, the latter process necessitating the use of high concentrations of fumigant and, of course, the vacation of the vessel during the operation. Now that rodents can be dealt with without vacating the vessel it is desirable that alternatives to hydrogen cyanide, which in any case has no residual action, should be available. With the ad-

A 'Tenate' operation. Polythene baiting cups in the 'tween deck of a ship being filled with 'Tenate' solution. The operator is protected with rubber gloves and each baiting point is numbered, records being kept to ensure their removal upon completion of the operation

Commodity being fumigated with methyl bromide under fumigation fabrics in a warehouse. The fabrics are kept down on to a sound base by heavy chains

vent of DDT and BHC it is now possible to use insecticidal materials that have residual effects which help appreciably in keeping sections free of insect vermin.

Accommodation spaces

In accommodation spaces the insects normally encountered are cockroaches, bed bugs and ants and the control measures employed vary considerably with the circumstances encountered: DDT or Lindane (pure gamma isomer of BHC) are used as liquid insecticides and applied under pressure with power spray equipment. In many cases water-based insecticides are used, although in some sections oil-based insecticides may be more desirable. In those parts where high temperatures are encountered a plasticising agent is included in the formulation to prevent the film of crystals becoming too hard when the insecticide dries out, which would permit insects to walk over them without being affected. Where an infestation is deep-seated with good harbourage, or where the infestation has not been kept within limits with periodic treatment, the use of Fumite smoke generators is most effective and spectacular. The sections concerned need to be closed down for a minimum period of about six hours and all drawers, cupboards, wardrobes, etc., opened up. The generators are then strategically placed to ensure overall coverage, a great advantage being that toxic films are deposited in places that could not be reached with normal spraying methods. The power of penetration of the vapour is indeed surprising and with a particle size of less than 1 micron deposits being microcrystalline in nature are correspondingly more effective against insects that pass over them. There is no risk of contaminating foodstuffs, as can easily happen when using oil-based sprays in pantries, etc., where foods are likely to be cut up or prepared on wooden surfaces that have been impregnated with the insecticide.

Insecticidal lacquers

Although urea-formaldehyde insecticidal lacquers have been used experimentally for some time (the company filed a provisional patent on these materials in 1948), they have of late received greater prominence. In principle, DDT, BHC or the newer insecticidal materials, aldrin and dieldrin, are incorporated in urea - formaldehyde resin and the colourless lacquer can either be power sprayed or painted on with a brush. When dry, the surface appears quite smooth, but, in fact, minute pores allow insecticidal material to ' leach ' off, forming a surface bloom. If this bloom is removed by washing, it will be replaced and the lacquers can remain effective for anything from 12 to 24 months. Unfortunately, the solvents used have a very low flash point and also the toxic effect of the vapours cannot be discounted. It is essential, therefore, that when using lacquers precautions are taken to ensure a through draught and adequate ventilation during the drying-out period. Additionally, the effectiveness of the lacquers can be short-lived if the surface becomes ' sealed off,' as, for example, by greasy deposits from galley fumes. Whilst, therefore, these lacquers have a useful purpose in insect control work, they should be regarded as an adjunct to other measures.

Having rid accommodation spaces of insects, residual powdering with compressed air is usually carried out behind cupboards, wardrobes, etc. Passenger vessels that are serviced regularly by us become remarkably free of insects, although it may be that treatment for two or three voyages is necessary before this condition is achieved. With vessels that are away from their home port for periods of, say, up to five or six months it is naturally a longer and more difficult process than with vessels that are only away for a few months.

Storage spaces

Here the infestation is usually Mediterranean mill moth (*Ephestia kühniella*), flour beetle (*Tribolium castaneum*) or similar pests of food products, although cockroaches are often also present. Treatment is somewhat more difficult, as the risk of contamination of foodstuffs is greater. Wherever possible condemned stores are removed prior to treatment, as this reduces the infestation as well as reducing the harbourage. In some cases spraying can be carried out with water-based Lindane, but the use of this material is limited. Wherever possible, the work is carried out with Fumite, DDT/Lindane generators and the bulk of the stores can be left *in situ*. Opened or exposed stores are removed or covered over to prevent direct deposition. Commodities in sacks or similarly protected can be treated and the deposits have the effect of sealing off against reinfestation. The use of Fumite is permitted where stores for human consumption are present, providing the deposits do not exceed seven parts per million, and in practice this condition is easily met. An advantage of the Fumite system is that store rooms need only be left sealed for a period of six hours or so and if contaminated stores are removed in the afternoon of one day treatment can be carried out in the evening and fresh stores loaded the following morning. In some cases where infestation is particularly severe or harbourage, such as the insulated refrigerator casing, is being used, or where rodents are also present, it is desirable to fumigate with ethylene oxide. This material (chemical formula C_2H_4O) has a boiling point of 12.5° C., great power of penetration and is not unduly harmful to human beings. It can be used in the presence of most foodstuffs without excessive contamination. Unfortunately, ethylene oxide is explosive and is normally employed in the presence of an excess of carbon dioxide. This mixture is known as ' Toxide '; it is inert, non-corrosive and non-inflammable. The fumigation period should be 24 hours and this, as well as cost, precludes its use except under circum-

stances where other materials would not necessarily prove effective.

Hold spaces

Frequently a vessel will have carried a grain or similar cargo that is insect infested and in consequence a residual infestation is left in the fabric of the hold upon completion of discharge. If the next cargo is one that is likely to be adversely affected by the infestation or is a cargo that will permit the infestation to survive, it is necessary for the hold spaces concerned to be dealt with. In some cases a vessel's charter may require fumigation to be carried out, as, for example, when carrying a Canadian grain cargo or a Rhodesian tobacco cargo.

In the Port of London, this work is usually carried out with hydrogen cyanide, using a very high dosage, from 8 to 12 oz. per 1,000 cu. ft. of space (in contrast to the 2 oz. per 1,000 cu. ft. of space usually used for de-ratting purposes), and the fumigation period extended to from eight to 12 hours. This process is fairly costly and because of the high concentration of fumigant used, the extended exposure period and the increased period required for ventilation before the vessel can be certified free of dangerous concentrations of fumigant the total period of the operation can be from 24 to 48 hours, a serious consideration to shipowners. Alternatively, however, if the work is not carried out—and particularly does this apply with Canadian grain cargoes—the vessel may require to fumigate at the port where the next cargo is to be loaded. In Canada, this work is carried out with methyl bromide and is very costly, being anything from two to three times the cost of a fumigation with high concentrations of hydrogen cyanide at a United Kingdom port.

Methyl bromide

Methyl bromide (chemical formula CH_3Br) is a colourless gas which solidifies at —93° C. and boils at 4.5° C. (40.1° F.). The fumigant is non-inflammable and has, in fact, great use as a fire extinguisher. The vapour is three and a quarter times as dense as air and upon release immediately falls to the lowest level, ultimately rising in an upward direction. There is at present only one type of apparatus available (the Halide lamp) which, without complicated chemical procedure, will give an indication of the presence of methyl bromide. Unfortunately, these lamps are not specific to methyl bromide, giving a reaction with any volatile halide. For this reason 2% chloropicrin is usually added to the fumigant as a lachrymator. Methyl bromide is extremely penetrative and has the added advantage that upon completion of a fumigation period it ventilates off more rapidly than hydrogen cyanide. From present knowledge it would appear that a man can breathe air contaminated with methyl bromide to the point where the contamination does not exceed 15 to 20 parts per million without ill effects. When foodstuffs are treated methyl bromide leaves very little harmful residues or none at all, with very little odour or taint. At present ships' holds are not generally treated with methyl bromide at United Kingdom ports, but it is a matter which is receiving considerable attention, particularly in view of the Canadian requirements.

Insecticidal smokes

An alternative to the use of gaseous fumigant is to treat the hold spaces with insecticidal smokes, and for this purpose Fumite generators are used. The system is simple and generators can be strategically placed to ensure that all sections receive correct dosage and coverage. An added advantage of this system is that a vessel can be treated immediately prior to leaving the port if she is sailing in ballast, it being left to the ship's personnel to remove the used generators in due course, or, alternatively, sufficient generators can be supplied to the vessels as sea-going stock for the ship's personnel to carry out the operation themselves.

Cargoes

Grains, seeds and animal feeding stuffs that are infested cargo are usually dealt with after they have been discharged into barges. By preference the barges should be hatched craft, with the cargo loaded to a level a little below the hatchboards and covered with two good tarpaulins. Fumigation is carried out with methyl bromide, using a space dosage plus an allowance for absorption of the fumigant into the commodity. The exposure period is usually one of 24 hours and ventilation requires approximately another 24 hours. If open-type barges are used, or if the cargo is stowed above the coamings, fumigation sheets must be employed to retain the fumigant. These sheets are of two- or three-ply rubberised silk, in size usually 60 ft. by 40 ft. The sheet is carried right over the overstow and weighted down to the deck of the barge with heavy chains. By utilising these sheets cargo can often be fumigated in open barges which otherwise would have to be reloaded into hatched craft. To minimise delay fumigation is often carried out before the barges move out of the dock in order that they may be ready for unloading at the wharf or wherever else they may be going.

Sometimes it is not convenient to fumigate infested cargo in barges and the procedure then is to fumigate under fumigation sheets in the warehouse or on the dockside, using methyl bromide or ethylene oxide. Alternatively, the commodity can be loaded into fumigation chambers at our depot for treatment. The procedure adopted depends upon the financial and other considerations.

Conclusion

From the foregoing it will be seen that vessels using the Port of London have a comprehensive service available for the control of both rodents and insects. The standards set in the port have become recognised all over the world.

FAO Conference

The Food and Agriculture Organisation of the United Nations began its seventh conference at its headquarters in Rome on November 23. It was expected to last three weeks. The main tasks of the conference were to review the general and technical activities of the organisation, examine the world food situation and decide on the programme of work and budget for 1954 and 1955. It was also to consider a number of constitutional, administrative and financial matters. The United Kingdom delegation was led by Dr. Charles Hill, M.P., Parliamentary Secretary to the Ministry of Food, with Sir Donald Vandepeer, former Permanent Secretary, Ministry of Agriculture and Fisheries, as alternate. Also included in the delegation were Dr. Norman C. Wright, Chief Scientific Adviser, Ministry of Food, Sir Geoffrey Clay, Chief Agricultural Adviser, Colonial Office, Sir Henry Beresford-Price, Deputy Director-General, Forestry Commission, and Mr. F. Grant, C.B.E., Under-Secretary, Ministry of Agriculture and Fisheries.

We hope to publish a report of this meeting in our February issue.

Technical News

In the January issue of *Petroleum* there is an article ' Heat Exchangers: Their Maintenance and Reconditioning,' by G. E. Halter, M.I.Plant.E. Also in this issue, P. W. Sherwood writes on ' The Removal of Hydrogen Sulphide from Hydrogen Gas: Current American Practice.'

Manufacturing Chemist for January includes ' Coumarin Anti-coagulant Drugs ' by D. M. Shepherd, W. Walker and R. B. Hunter; and 'Ampholytic Detergents ' by Dr. Richard Neu.

The January issue of *Chemical and Process Engineering* features ' Heat Transfer ' by J. Moss, B.Sc. (Eng.); and ' Ultrasonics in Industry, Part 2, Applications,' by M. H. M. Arnold, B.A., B.Sc., F.R.I.C.

Soil Conditioners

C. L. W. SWANSON

On many occasions we have referred to the new soil conditioners which have attracted so much attention of late years, of which Krilium was the first and the forerunner. They have attracted most attention in the U.S.A. and the following article by Dr. C. L. W. Swanson, of the Connecticut Experiment Station, which we reproduce below, provides a comprehensive review in regard to the present position and outlook for these substances in that country.

AMAZING claims have been made for the new soil conditioners. Some hail them as wonder chemicals which, sprinkled on the ground, turn clay or sand to rich, loose topsoil in a few hours, removing all need for organic matter and the back-breaking labour of digging and cultivation. More modest statements are that the chemicals stick clay particles in soil together into crumbs or aggregates, thus changing hard, cloddy and crusted soil into one more suitable for crop growth. But the soil must first be worked to get it into suitable tilth; then the chemicals must be applied and mixed thoroughly into the broken-up soil; finally, it must be wetted to make the chemical act on the clay particles, ' fixing ' the mellow condition of the soil. These claims eliminate no work, but do maintain that a favourable physical condition is produced lasting over the growing season and possibly longer. But are the soil conditioners really practical, or just a glamorous novelty? Enough tests have now been run to begin to strike a balance.

The great German chemist, Justus Liebig, discovered more than a century ago that chemicals could aid the growth of plants. Using sulphuric acid on bones to release their phosphorus as plant food, he founded the vast chemical fertiliser industry which today is said to be responsible for about 20% of our greatly increased crop yields. If chemicals can thus supplement the natural fertility of our soils, why not a chemical to substitute for the humus and clays which in the best soils are bound together in loose clumps, thus improving soil structure? This was the question which the Monsanto Chemical Co. asked its research staff, and which led to the organic compounds now used as synthetic soil conditioners. It is a discovery that may well rank in importance with chemical fertilisers. But it must be viewed in the perspective of what soil conditioners are, how they work, how they are best applied, and exactly what they can and cannot do.

Nature and limitations

Soil conditioners continue to multiply on the market, but nearly all belong to one of three classes of materials: polyacrylates, polyvinylites and, smallest in volume, cellulose derivatives. Other materials being investigated are lignins, silicates and the versatile silicones, all of which improve soil structure, but have such drawbacks as high alkalinity, waterproofing effects or difficulty in application. Another conditioner recently introduced from Europe is a ferric ammonium compound, claimed to be especially useful in alkaline clay soils. Low in cost, it will probably be limited in use to some of our Western soils.

The two synthetic conditioners most widely available are a modified hydrolised polyacrylonitrile (yellow in powder form) and a vinyl acetate and maleic acid compound (white). These are sold under many trade names in powders, flakes or liquids. Being able to take up water, they are usually mixed with an inactive diluent in strengths of 25% or 40% to reduce deterioration in storage, as well as to facilitate application in the proper small amounts. Chemically they are long-chain polymers, with molecular weights in excess of 50,000, related to the synthetic fibres and plastics. One of them, in fact, is a basic raw material for Orlon, Dynel and other acrylic fibres. Since these materials have no nutrient value, their first limitation is that they cannot serve as fertilisers.

Functionally the conditioners are water-soluble polyelectrolytes, which simply means that in solution their molecules have many electric charges. These charges attract clay particles in the soil like a magnet, forming many small lumps or aggregates. This, indeed, is the way in which natural soil conditioners, the decomposition products of such organic materials as manure, compost and other plant residues, bind soil particles together. (In addition, of course, many natural conditioners are also fertilisers.) The resulting structure improves soil aeration, moisture balance and the ability of plants to take up foods. But whereas the natural conditioners are readily broken down by bacteria and must often be replenished at the end of a season, the synthetics are much more stable. Once added to the soil they ' set ' quite rapidly, resist bacterial attack and do not leach out. In tests to date their effects have lasted as long as three years.

This advantage, however, leads to another limitation. Research by W. P. Martin and his associates at the Ohio Agricultural Experiment Station shows that 24 hours after application most of the chemical has acted on the soil. Within 48 to 72 hours chemical action is essentially complete. This lag can cause trouble in greenhouse potting. If the conditioner and soil are mixed and wetted immediately before potting, some of the conditioner will act on the walls of the pot, causing the soil to stick to them. In outdoor applications, if it rains before chemical action takes place, the soil will be dispersed by the beating rain and the chemical will set the soil in this dispersed condition, leaving it poorer than before. Tillage may break up such dispersed or slaked soils, but it is then doubtful whether the conditioner will be of as much use.

Methods of application

Many disappointing results in using soil conditioners probably stem from a misunderstanding of how they act. They *stabilise* the existing soil structure pretty much as they find it. Hard, lumpy, sandy, slaked or ' run together ' soils cannot be made into soils of good tilth simply by the application of the chemicals. If not worked in, the conditioners act only on the top eighth of an inch or so of soil. Once applied they do not, like nitrogenous fertilisers, work down in the soil as the season progresses. If a soil is in poor tilth, the conditioners will ' fix ' this poor tilth. Actually, of course, it is almost impossible to add conditioners to a soil without disturbing it in some way, whether by spading, hoeing, harrowing or discing, which in themselves improve tilth.

Therefore the method of application is extremely important. This past season the Connecticut Agricultural Experiment Station ran some tests to determine the amounts required, the ease of application and the efficiency of various soil con-

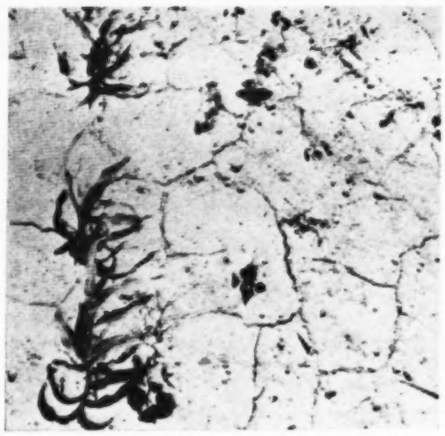
ditioners in powder *v.* liquid form. One test, for instance, took place on plots of snap beans in Cheshire fine sandy loam, using varying amounts of five soil conditioners.

Regardless of form, it was found that if the chemicals were put down in excessive amounts—the largest quantity used here was 3,125 lb. per acre to a 3-in. depth—they retarded germination, repressed plant growth and produced lower yields than the untreated plots. Being essentially plastics, the conditioners literally plasticised the soil. Part of the chemical remained on the surface, binding it into a gummy mass which hardened into clods on drying, like a wet ploughed field in spring. Better results and yields are obtained by applying much smaller amounts. These range from 500 to 1,000 lb. per acre to a 3-in. depth, depending on type of soil. This works out to about 1 to 2 lb. per 100 sq. ft. In this Connecticut test, possibly because the clay content of the soil is low compared with test plots elsewhere, the lower of these amounts worked best.

Sometimes the recommended amounts are too small. When the specifications of some manufacturers were followed it was found that the application was too thin, covering too large an area with too little chemical. More disconcerting was the failure of some packagers to indicate the percentage of active ingredient, which one needs to know in order to increase or decrease the rate of application as conditions warrant. Some formulators seem deliberately to recommend dilute, unsatisfactory applications to make their product appear more efficient than others.

Generally, the powder forms were found to be more practical and easier to apply than the liquids. They can be distributed by the usual fertiliser equipment, though they tend to blow about in windy weather. The liquids are hard to handle; they are slippery, slimy, sticky materials to mix and apply. Some are more soluble than others, but all require large amounts of water. At a rate of 1,000 lb. per acre the least soluble types plug up spray nozzles. For large areas, application in solution is not practical and in the higher concentrations it is nearly impossible.

Liquid conditioners may have a place in such specialised uses as surface treatment of seed rows to prevent crusting and to improve emergence of seedlings. M. T. Vittum and N. Peck, of the New York State Agricultural Experiment Station at Geneva, have developed machinery to do this which sprays a 2- to 4-in. band of conditioner from a nozzle mounted just behind the planter shoe of a tractor-planter. It can be accurately controlled to spray concentrations varying from .02% to 2%. Knapsack sprayers may also be used. Fast emergence of seeds and improved stands are reported on carrots, beans, peas, beets, cotton, lettuce, radishes and tomatoes. Such use is practical because treatment involves only the top ¼ in. of soil, and liquid sprays can be more uniformly applied here than powders, which are difficult to work into shallow depths. The cost of such narrow-band applications is said to be as low as $5 per acre, which would make them more economic than treatments running into hundreds and thousands of dollars.



The cracking of soil planted to maize at the Connecticut Station was prevented by soil conditioners. (*top*) **An untreated Cheshire fine sandy loam.** (*below*) **The same soil with 1,000 lb. of conditioner per acre**

Efficiency

The efficiency of soil conditioners is harder to assess than the rate and ease of their application. It seems to vary with the soil, crop and amount of conditioner appropriate to each. Some tests have shown increased yields, others decreased. Soil scientists are still experimenting to find the answers. In general, lettuce, snap beans and carrots have shown increases in the Connecticut Station tests. But other crops, such as tobacco seedlings in loamy sand, grew faster and more vigorously in peat-treated rather than synthetically conditioned soil. These tests were on soils different from the one reported earlier and they required higher rates of application for best results.

Lettuce was planted in three Connecticut soils: Carver loamy sand, low in clay (4%); Enfield very fine sandy loam, intermediate and highly erosive; and Buxton clay loam, the state's most clayey soil (30%). Four rates of dry conditioner (200, 1,000, 2,000 and 4,000 lb. per acre) were tried on each soil to a depth of 3 in. and these were compared with manure applications and with untreated plots. The same amount of commercial fertiliser was added to each. In all cases except two, where plant disease retarded and killed some plants, the chemical conditioners increased yields. Oddly, the biggest percentage increase (325% at the 4,000-lb. rate) was in the Carver soil, a result which runs counter to prevailing research showing that soils low in clay are least improved by conditioners. Actually, however, on a weight basis the best improvement shown was in the heavy clay of treated Buxton soils, which produced two or three times more lettuce than untreated plots. Manure increased yields, but not as much as the heavier rates of conditioner. In every case increasing amounts of conditioner improved tilth or aggregation.

The Pennsylvania Agricultural Experiment Station has reported increased yields of sweet corn, potatoes, tobacco seedlings and greenhouse roses in structurally poor soils treated with conditioners. The West Virginia Station, testing for tomatoes, beans, cabbage, corn, carrots and cucumbers, found that only bean yields were increased. The Ohio Station obtained no significant increases of potatoes and sugar beets on a Brookston silty clay loam, but on this same soil marketable carrots were increased 21%. Corn and red beets likewise showed marked increases on treated Paulding clay, and field corn on a Miami silt loam subsoil yielded 15 bushels per acre more than on similar untreated soils. The U.S. Salinity Laboratory at Riverside, California, testing alkali soils, increased production of sweet corn and found that conditioners greatly improved both saline and non-saline soils under irrigation.

Some tests have been made on conditioners combined with fertilisers in order to apply both in one operation. Ohio Station research indicates that such mixtures are not entirely compatible, tending, particularly in the mixture of fertiliser with polyacrylates, to deter soil aggregation.

However, field tests show that this effect is not too significant, since aggregation as well as corn yields were improved in soils so treated. Plant tissue analyses showed that conditioners, in turn, have no effect on the uptake of fertiliser elements.

In general, greater aggregation and better results have been obtained in fine-textured soils rather than coarse. Some research also shows that the chemicals work more effectively on clays that are low in cations, but this is not conclusive. Other factors, such as organic matter, salt content and soil reaction, probably also enter into it. Treated soils warm up earlier in the spring because their loose structure causes them to dry out faster, become darker and absorb more of the sun's rays. Measurements in Connecticut last February 24 show 50 foot-candles more light being absorbed by conditioner-treated soils. Earlier spring planting is feasible in these more friable soils.

Outlook

Other special advantages accrue from soil conditioners. They may prove useful in combating erosion. Tests by H. L. Borst, of the Ohio Station, show that, in a three-month period, treated agricultural soils lost 5 in. less water and 3,400 lb. less soil per acre than untreated soils. They may be particularly useful in holding soil on raw banks and slopes until vegetation develops. The Connecticut State Highway Department finds that conditioners control erosion fairly well in such places and to some extent aid grass growth. Though they are not equal to hay mulch for these purposes, they do not blow away on steep slopes and they allow less mulch to be used. For the straight growing of grass, soil conditioners are not of much use on old lawns, but they may improve new lawns, especially if the soil is clayey, and providing they are mixed well into the soil before seeding.

All preliminary data indicates that there is a long road of research ahead before these new chemicals may be said to be practical on a wide scale. Research so far suggests that there is an optimum tilth or aggregation to be achieved for each soil to promote the best plant growth. Chemical conditioners offer a tool for ascertaining this optimum. Not enough research has been done to indicate conclusively that any one chemical is better than the others. Some report that the polyvinylites are more effective. The Connecticut Station tests thus far, on the other hand, gave the edge to the polyacrylates. The chemicals just have not been evaluated sufficiently to rate them as to their relative effectiveness.

They can never in their present form fill the role in the soil of organic matter. While organic matter decomposes and loses its aggregating effects quicker than the chemical soil conditioners, it provides food for the micro-organisms without which a soil cannot be productive. However, the tests here recited show that all the soil-conditioner chemicals tested do stabilise the soil, provided sufficient amounts are used and are thoroughly worked in. This is a notable and useful achievement capable of further development.

(*From the ' Scientific American.'*)

African Food Production

Increasing food production in British colonial territories was one of the major interests of African and European members of a recent Colonial Office administration course held at Queen's College, Cambridge. The subject was ' Rural Economic Development in Africa.' Fifty of those attending, including representatives of the Governments of U.S.A., Belgium, Holland and France and American universities, visited Pest Control Ltd., of Cambridge, to see a demonstration preview of various equipment designed to improve rural economy in Africa and the Far East.

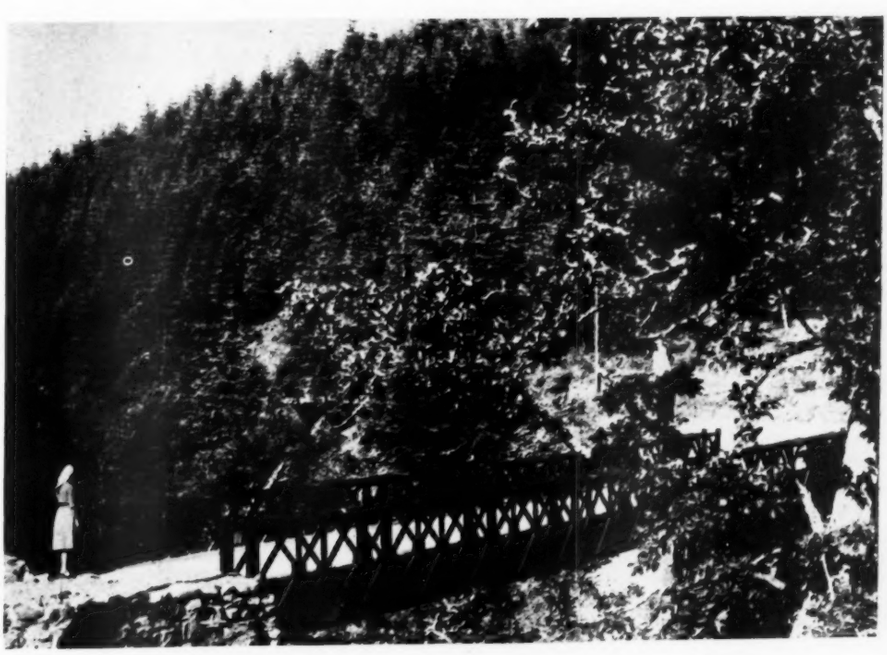
The demonstration included a preview of novel, ingenious but inexpensive tools for the peasant as well as the more advanced types of equipment—power sprayers and spraying aircraft and helicopters which are used on an extensive scale in Government-sponsored and co-operative agricultural schemes. Among the spectators were representatives of government entomological services from India, Pakistan, Ceylon, Indonesia and the Philippines, forming the group now studying the methods of Pest Control Ltd. under the provisions of the Colombo Plan.

North Wales Forest

More than 12 months ago the English Forestry Commission was declaring at the larger agricultural shows that the timber increment in the State forests of Britain exceeded 1 cu. ft a second. There has naturally been some increase since then.

Coed y Brenin, in North Wales, is a typical example of one of the rapidly expanded State forests in semi-mountainous country. The whole of this forest's area is about 17,000 acres, of which about 9,000 acres are already under plantations, mainly conifers. Of the remaining 8,000 acres, about 1,000 ranks as plantable.

With the increase in the weight of the out-turn from such forests as this the expenses of road making and bridge building are likely to rise, since the older ' communications ' of the countryside were not intended to be adequate for the extraction of heavy crops of timber. Bailey bridges are now being widely used in the larger forests.



A Bailey bridge in Coed y Brenin forest

South African Crop Prospects

OUR South African correspondent has sent us the following information on agricultural developments in the Union of South Africa.

Bananas

A banana boom in ' Jock of the Bushveld's ' hunting country has brought new faces flocking into the Transvaal Lowveld. Land which fetched £2 10s. a morgen 12 years ago is now fetching £35 without irrigation and £150 with it. Where bananas in bearing have been established, prices of up to £750 a morgen are said to have been offered. Bananas are said to give a gross return of up to £500 a morgen a year under good management, and the crop is so new that pests and diseases have not yet appeared. Although banana growing is becoming popular throughout the Lowveld, experts consider that Kiepersol is one of the best sites because it has the deep heavy soils, high rainfall and almost complete absence of frost needed by bananas. Banana growing in the Transvaal began when a Mrs. Lloyd many years ago planted on her farm some suckers which a transport rider had brought from Lourenco Marques. Even after the war Kiepersol, which adjoins the Kruger National Park on one side and is overshadowed by the Transvaal Drakensberg mountains on the other, was practically uninhabited. Now at least 300 morgen are under bananas, 5,000 natives are working on the new irrigation farms and holdings and there are six native stores, two farmers' associations and other amenities.

Grapes

The South African market is receiving sufficient grapes and no complaints have been received, the manager of the Deciduous Fruit Board said at a recent meeting in Paarl of fruit exporters. He considered that the Union market could become more important each year to grape growers. Grape sales on the South African market totalled 6,243 tons last season against 6,444 tons the previous year. In 1949-50, the quantity sold was 7,077 tons. The total quantity of grapes available for sale in South Africa last season was 12,000 tons against 17,330 tons for export.

Citrus fruit

The citrus season now drawing to a close has been exceptionally good, both in the quality of the fruit and the quantity exported. In the early part of October it was reported that 1,300,000 cases had been shipped through Port Elizabeth. Further lots had then to come from a number of small growers in the Eastern Cape, so that this year Port Elizabeth would export 1,500,000 cases, mainly to Britain. Because of favourable weather and rains just at the right time, citrus fruit has been of exceptionally good quality, so much so that first-grade export fruit has had to be withdrawn from shipment for local markets. Prices have been good, though there has been a tendency for them to ease overseas in recent weeks. Growers appear generally to be well satisfied with results of their labours. From January to August imports of general cargo through Port Elizabeth have shown a progressive decline, but on the other hand from March to August exports of citrus have doubled when compared with those for the same period of 1952.

Tobacco prospects

The two-fold plan of the South African Tobacco Board to increase exports and reduce imports of tobacco leaf is shown in a statistical review of the industry recently issued by the board. Higher prices were offered to producers to grow Orinoco leaf instead of Amarello, because Amarello leaf is not palatable to overseas smokers and the export market was dwindling. The switch to Orinoco leaf would also tend to reduce imports. In 1951-52 the Union produced only 2,000,000 lb. of Orinoco, but the figure leaped to 14,500,000 lb. in the following season. During the same period exports increased from 1,390,000 lb. to 4,693,000 lb. and from 1951 to 1952 imports fell by 1,500,000 lb.

Maize production

Plans to increase the maize crop, entailing vastly expanded production of hybrid maize seed with the aid of private enterprise, have been drawn up by the Maize Control Board. Trial plantings of this seed, which has hitherto only been available for experimental purposes, have indicated that it yields nearly a third more than ordinary seed. This season the board has available about 10,000 bags of hybrid seed, and if its plans succeed production will jump to between 40,000 and 60,000 bags, which will be available for sale to farmers next season. The statement says that, having thoroughly tested the value of its parent seed stock, the board has decided to make enough hybrid seed available to private seedsmen and selected members of the mealie co-operative to plant about 4,000 morgen in the coming year.

The 1953 maize crop is expected to break all records and to be the biggest ever harvested in South Africa. The Department of Economics and Markets estimates the crop at 32,854,000 bags. The previous record of 32,119,000 bags was set during the 1947-48 season. Two reasons for this year's record are that the rainfall during the season was excellent and farmers had cultivated more land. As a result of the failure of the wheat crop in the Orange Free State in 1952 because of the late rains, farmers ploughed in their wheat and used the extra land for maize to make up for their losses. On the whole, the season has been an excellent one. Europeans and non-Europeans have harvested 2,421,000 bags of kaffircorn. This is regarded as a bumper crop.

The previous year's came to 1,543,000 bags. The groundnut crop in 1953 was also expected to be the biggest ever reaped. It would have been larger still but for the drought.

Sugar output

A record output of about 720,500 tons of sugar is expected from Natal this season. An earlier estimate was 704,500 tons. The South African Sugar Association says that although the industry was confident of beating the 1950-51 record of 685,000 tons, the end of the long dry winter with 2 in. of rain at the end of August and another 2 or 3 in. in September has confirmed the earlier promise of a record crop. This estimate, with a substantial carry-over from the last season, assures an abundant supply of all the needs of South Africa for direct consumers and secondary industries.

Timber prospects

South Africa has 1,750,000 acres of forests, providing 100,000,000 cu. ft. of timber, while the country's annual consumption is 161 million cu. ft., according to Mr. J. D. Keet, a former Director of Forestry. He is now technical adviser to the Department of Agriculture. Mr. Keet estimates that in the Union there are nearly 1,500,000 acres of further land suitable for forests. If this land was used for growing trees he believes that the Union could be self-sufficient in timber in about 50 years time.

Australian Wheat Marketing Structure

Mr. John McEwen, the Australian Minister of Commerce, has announced that the Federal Government is to legislate

to establish an orderly wheat marketing structure, as far as its authority will allow. The intention was to provide as a minimum a structure which would allow export in an orderly manner and so enable ratification of the International Wheat Agreement.

Mr. McEwen, whose statement follows disagreement between the states and the Commonwealth on a uniform price for the new season's wheat, stated that no part of Commonwealth legislation could of itself produce orderly marketing or enable ratification of the I.W.A., but it could be brought into being by proclamation if state governments legislate in a complementary way to divert wheat to a wheat board.

Mr. McEwen said that from September 30 the Australian Wheat Board ceased to have power to receive new wheat for sale overseas or within Australia, but it could continue to deal with previous crops. The Commonwealth had never contemplated that its legislation would be anything other than part of negotiated interlocking Commonwealth-state Acts. It now felt impelled to be prepared to legislate alone in the first place and in the absence of agreement it would do so before it was too late.

'Gammasan' seed-dressing field trial. On the left-hand side of this kale, dressed seed was sown, with a resulting good stand of plants. On the right-hand side, untreated seed meant that heavy flea beetle attack destroyed many young plants

'Gammasan' seed-dressing trial for the control of flea beetle. Left-hand side—dressed seed sown. Right-hand side—with comparatively thin stand, untreated

A New Dressing for Brassicas

Plant Protection Ltd. have recently announced the production of a dry seed dressing to protect Brassica crops against flea beetle or turnip fly. These insects belong to the order Halticinae and various species have been recorded as damaging Brassica crops in many countries in North Europe as well as in parts of North America.

Ordish, in his book 'Untaken Harvest,' estimates that in Great Britain the damage annually done by flea beetle costs over £5,000,000 a year, while turnips and swedes valued at £1,000,000 are lost.

To the dressing the name 'Gammasan' has been given. It is stated to contain gamma BHC and also the fungicide thiram. The gamma BHC provides protection against the flea beetle and the fungicide gives protection against foot rots.

In Britain, the greater part of the damage is caused by over wintering beetles in the soil which attack the young seedlings. It is claimed that 'Gammasan' has some systemic action and so protects the leaves of the seedling as well as their roots. It is stated that seedlings from treated seed emerge more quickly and therefore, in addition to protection against flea beetle, there is less competition from weeds.

Seed dressed with 'Gammasan' can be sown successfully by cup-feed or forced feed drills.

The makers state that in England and Wales 'Gammasan' should be used at the rate of $\frac{1}{2}$ oz. per lb. of seed, while in Scotland and Northern Ireland $\frac{3}{4}$ oz. per lb. of seed should be given and it is claimed that in a normal year this will give full protection to the crops up to the emergence stage and beyond. If heavy flea beetle attacks should develop despite this spraying with 'Didiman'-25 or dusting with 'P.P.' flea beetle dust may be necessary.

It is also claimed that 'Gammasan' provides protection against carrot fly, used as a seed dressing at the rate of $1\frac{1}{2}$ oz. per lb. of seed.

Indian Flour Exports

India has begun the export of wheat flour after a lapse of 12 years to her pre-war markets, now dominated by Australia. With a view to stimulating exports, the Indian Government has agreed to supply wheat from its own stocks to flour mills, to be replenished later by the mills from imports on the mills' accounts.

Total stocks of wheat with the Central and State Governments are estimated at nearly a million tons. Under the International Wheat Agreement India is committed to buy a million tons before the end of the year.

RESEARCH DEVELOPMENTS

Cereal Yields in Eastern England

AT a recent conference organised by the British Ministry of Agriculture's National Agricultural Advisory Service for the Eastern Province of England some interesting details were given by Mr. C. V. Dadd, Provincial Crop Husbandry Officer, of the results of some hundreds of trials with varieties of different cereals under conditions in Eastern England by the National Agricultural Advisory Service and the National Institute of Agricultural Botany.

In the course of his address Mr. Dadd emphasised that it seemed as if a premium in yield had to be paid if quality varieties of wheat or barley were grown in preference to the recently introduced high-yielding types. Farmers who were still satisfied with their corn varieties should be very careful before changing to the newer types, unless there is good evidence that material benefit would result. There is no short way to proving the reliability of varieties like Bersee or Kenia.

The quality wheats at present available were Holdfast, Redman, Yeoman, Atle and were likely to include the new spring variety Atson. Turning to the French high-yielding winter wheats, Mr. Dadd said that properly top-dressed with nitrogenous fertilisers, and when yellow rust did not intervene, they did not appear to be more productive than Nord Desprez and Cappelle Desprez. Hybrid 46 was a close follower and Bersee was still within the top group. Evidence from many trials suggested that one could expect to pay a premium in yield in respect of quality of between 20% and 25% as between, say, Cappelle Desprez or Hybrid 46 and Redman or Holdfast.

Good quality baking wheats were usually associated with high protein of the grain. If the new French wheats are grown, it is recommended that users should be generous with dressings of artificials, particularly nitrogen. Trials had proved that up to 3 cwt. of sulphate of ammonia per acre could safely be applied and response to liberal applications of fertiliser was most noticeable.

Spring wheats appeared to yield some 20% less than winter wheats under ordinary conditions. Of these, there was little to choose between Bersee and Atle when judged on yield alone, although on field characters and quality one would usually choose Atle. It was evident that the French wheats did not tiller so well as the old varieties like Little Joss.

Discussing barley, the position seems to be somewhat similar, as the highest yielding Scandinavian types like Herta regularly outyielded the English malting types, such as Spratt Archer, by something like 20% to 25% and Kenia by 15% to 20%. Once again high nitrogenous manuring is essential to obtain full benefit from these new varieties. Freja seems to be a valuable high-yielding, short-strawed, early Scandinavian type and is particularly suitable for very rich soil conditions. Carlsberg appears to be intermediate both as regards yield and quality, while Proctor, which has still to prove itself on a field scale, has considerable promise for combining, with both yield and quality in view. In favourable seasons Carlsberg is acceptable to many maltsters and if growers are looking for increased yields, with quality, they might consider this variety.

The oat varieties S.147 and S.172 are likely to remain the most popular for winter sowing, but Picton is a very good alternative to S.147, being somewhat better in quality and more resistant to eelworm attacks, although slightly lower yielding. Spring oats did not show the marked differences found in the other cereals and under good field conditions there was little to choose between Sun II, Opus, Eagle and Star. For moderate fertility conditions, Maldwyn (S.221) showed to advantage, but on yield alone Milford (S.225) seldom came into the picture, being usually outyielded by the others. The latter is, however, quite suitable when grown in fen areas, as its chief merit lies in the shortness of the straw and resistance to lodging.

For those who grow rye for grain production, Mr. Dadd suggested that the varieties Pearl and Petkus are likely to outyield King II, although the differences are not very great.

The Agricultural Engineers' Association

The membership of the Agricultural Engineers' Association includes the principal manufacturers of agricultural machinery, a number of wholesale distributors and other concerns engaged in engineering activities in Great Britain. It was established in 1877. The Association is governed by an elected council which meets frequently to review all questions affecting the industry. Latterly, the Association has undertaken the activities of the British Agricultural Machinery Manufacturers Export Association (B.A.M.M.E.X.), which has now been dissolved.

The A.E.A. aids its members in meeting overseas and export demands and the ever-increasing competition from abroad in the world markets. The export division maintains close touch with the commercial departments of foreign embassies, dominion and Colonial Trade Commissioners and all British Government Departments concerned with the agricultural engineering industry. It is able to instruct members on all matters relating to shipping and export sales.

Dr. John Renny, who is the director of the Association

The Association maintains close touch with the National Institute of Agricultural Engineering and it also maintains a joint consultative machinery committee with the National Farmers Union so that matters of interest to both manufacturers and farmers can be discussed.

Standing committees deal with costs of production and transport, both matters demanding continual attention in the interests of manufacturers, buyers and users. It is responsible for organising the post-war Smithfield Show and Agricultural Machinery Exhibition in conjunction with the Smithfield Club and the Society of Motor Manufacturers and Traders Ltd.

The Association's importance can be judged by the fact that the turnover in all classes of tractors, implements, machinery and equipment in 1952-53 is 22 times that of 1939 and exceeded £107 millions during the past year.

The President of the Association is Captain E. N. Griffith, Chairman and Joint Managing Director of Rotary Hoes Ltd., and its Director is Dr. John Renny.

NEW BOOKS

Egyptian Cotton

By C. H. Brown, B.Sc. Pp. xi + 174, with 21 illustrations. Leonard Hill Ltd., 9 Eden Street, London, N.W.1. 1953. 16s.

This is a work of considerable importance. The development of the Egyptian cotton industry has been a major event during the past 50 years not only in regard to production but also in relation to quality, which has improved steadily. Today, with the exception of a small amount of Sea Island cotton grown in the West Indies, Egypt holds the palm for producing the finest and longest stapled cotton in the world.

Having regard to the haphazard conditions under which Egyptian cottons were evolved in the early days, the stages by which it arrived and has been maintained at its present pitch of excellence make a fascinating story. Certain it is that Egyptian cotton could not possibly have arrived at its present stage of development had not the Egyptian authorities had the wisdom to enlist at the beginning of this century the assistance of a number of British scientists under whose direction the work of improving and maintaining the quality of Egyptian cotton has until recently been carried out. The first of these was Dr. W. L. Balls, whose influence on the industry cannot be overstressed, others have been M. A. Bailey, the late H. A. Hancock and the present author himself.

In this book the author traces the history of the Egyptian cotton industry from its early beginnings in the second decade of the 19th century down to the present day, and describes and discusses its various factors and aspects. The most important section of the book, however, is the chapters which are concerned with the breeding of cotton varieties in Egypt and the questions of seed supplies and cotton varieties. While it is well known that the quality of Egyptian cotton is the result of the breeding work undertaken under the Egyptian Ministry of Agriculture, the technique employed is less well known, published accounts of it being, so far as the reviewer is aware, confined to bulletins published by the Ministry.

In providing an account of the position in this regard Mr. Brown has therefore performed a service for which cotton breeders the world over should be grateful. The chapters which contain this account are not altogether easy reading, but the interested student who follows them closely will be amply rewarded. The techniques described depart somewhat from those followed by other plant breeders in some respects, but it must be agreed that in cotton breeding as in other things the proof of the pudding is in the eating, and in this instance there would seem reason to believe that the methods in question have successfully delivered the goods.

Other parts of the book contain interesting discussions of the economics of cotton production in Egypt, and here the author strikes out his own line of argument in his defence of the policy of concentrating on cotton production in Egypt rather than attempting to diversify agricultural production and to lay increased stress on the production of food stuffs. Many will not agree with the author here, but all will respect the candour with which he advocates his point of view and his refreshing freedom of expression on occasion.

The book is well illustrated with a number of excellent photographs of cotton production, while throughout it is fully documented with numerous tables of statistics. It is prefaced by a foreword by Sir Ralph Lacy, until recently chairman of the Raw Cotton Commission. With him we cannot but deplore the fact that thanks to the violent and unreasoning prejudices of Egyptian nationalism, the government of that country should have been moved to terminate the engagement of the author with the Egyptian Ministry of Agriculture and bring to an end the career of usefulness to the Egyptian cotton industry which he had successfully pursued for over 30 years. It seems one of the most perfect examples of facial mutilation to improve appearances that one could desire. It is at least one point to the good that this lamentable procedure should have left the author free to have produced this excellent account of the industry, and should also have given him the opportunity of making his services available for use in cotton breeding work in other lands.

H.T.

The Manure and Fertiliser Notebook

By J. Stewart Remington and Wilfrid Francis. Pp. viii + 123. Leonard Hill Ltd., 9 Eden Street, London, N.W.1. 1953. 12s. 6d.

This is the fourth edition of a book which has won appreciation from a large circle of readers. The original edition appeared in 1943 from the single pen of the senior author; this edition has been produced with the collaboration of the second author and has been considerably revised and enlarged, although the essential plan and object of the work remain unchanged. The intention of the book is to provide farmers, horticulturists and gardening amateurs with a handy work of reference to which they can turn for information on topics relating to the manuring of crops and garden plants. It can be agreed that the book fills this intention reasonably adequately.

The new sections supply information *inter alia* on plant hormones, trace elements, soil acidity, soil analysis and soil conditioning. Incidentally, under these heads, reference is made to Dr. Stiles Mason's book on trace elements, but no reference is given to Prof. Wallace's work on this subject and his illuminating atlas of deficiency diseases. An omission also is a reference to the use of gypsum (calcium sulphate) in reconditioning U.K. lands inundated by sea water, brought into such prominence as a result of last winter's floods on the East Coast. Another omission is reference to the new polyelectrolytic soil conditioners of which Krilium is an example and which have attracted so much comment of late.

Also one wonders whether the information given about analytical methods will really prove of value to the majority of the audience for whom the book is intended. Apart from these minor matters, however, the book, which is now bound in a neat green cloth binding and enclosed in an attractive dust cover, should prove a useful vade-mecum for the audience to which it is addressed.

The Harvest Labour Market in California

By Lloyd H. Fisher. Pp. 183. Harvard University Press and Geoffrey Cumberlege. 1953. $4.50.

The author of this book, Mr. Lloyd Fisher, was Professor of Political Science in the University of California, and it is sad to relate that he died at the early age of 41, just before the work was published. To quote the publisher's remarks on the dust jacket of the book, it is essentially an analysis of the market for casual labour in California, where for many years farmers have complained that the supply of migrant labour is insufficient, while the farm workers themselves have also complained about the incidence of unemployment.

Actually, it is the incidence of the harvest in California which has created this high seasonal demand for labour, which is met at present by migrant labour which has been drawn in turn from immigrant Chinese and Japanese and latterly, in face of the active discouragement of these migrations by the Federal authorities, by immigrants from Mexico.

This type of difficulty is, of course, no

new thing—it has occurred in many lands —but it is somewhat startling to learn that in the U.S.A. a state of affairs exists in which farmers tolerate this type of immigration and, in fact, rather prefer the Mexican immigrants to those of other races inasmuch as they are more submissive and tolerant and are unable to unite to secure better conditions because of the opposition of organised labour in the States on the one hand and the somewhat ineffective restrictive measures of the Federal Government.

One is compelled to agree with the author that in the long run the best solution may be the development of mechanical methods of harvesting which will eliminate to a large extent the heavy seasonal demand for casual labour and lead to the disappearance of a body of individuals who are admittedly a social problem.

The Forester's Handbook

By H. L. Edlin. Thomson and Hudson. 35s.

A more accurate title for the book might be ' The British Forester's (Forestry Commission Model) Handbook,' for British forest conditions govern, and the commission's practice dominates, the treatment of the subject. Allowing for these restrictions the author deals with the various phases of forest work in a very practical way. Plantation work from the collection of the seed on to the weeding of the established crop of young plants is gone into very thoroughly and some handy tables of espacement, size of plants and representative prices are given. This is the best section of the book.

Natural regeneration is dismissed in nine pages and one cannot help feeling that the author shares the commission's contempt for this form of regeneration. This is a pity as most foresters find the greater pleasure in beguiling rather than forcing nature to do what they want. Thinning gets rather less attention than this most important operation deserves. Here, again, useful tables of stocking and espacement are given. Measurement and valuation are well condensed and adequately treated.

Coming to forest management one notices the forestry commision's dislike of the words ' Working Plan ' which the author seems to believe must denote a three volume novel. He evidently has not come across those only taking a couple of sheets of foolscap and easy to work. The ' Plan of Operations ' he describes would, as he recommends, contain virtually everything that a good working plan should contain.

It is a pity that the forms which register the execution of operations prescribed in the plan are not called ' Control Forms ' as accepted by the British Commonwealth terminology. It would have been an advantage had reproductions of these forms been given as an appendix. The subject is well condensed and also helps the private owner to thread his way through the maze of Regulations of Forestry Acts and Tree Preservation Orders.

One of the best chapters is that on financial assistance and taxation and is as clear a statement of what the layman in law can hope to get and what will be taken off him as can be expected. Taken all round the book is a very useful one for the forester to have by him and the layman can gain from it a fair picture of what British forestry means and the work it entails.

W.A.R.

A Report on Cocoa Research, 1945-51

Pp. 132, illustrated. Imperial College of Tropical Agriculture. 1953. 25s.

This volume is an account of cocoa research carried out at the Imperial College of Tropical Agriculture between the years 1945 and 1951. It is the successor of earlier reports published in preceding years; during the period in question the staff of the cocoa research organisation at the College has been greatly increased and the volume of research recorded and also its quality show a marked advance. The report is prefaced by an introduction by Mr. H. J. Page, C.M.G., who until recently was Principal of the College and Director of Research, who passes in review the communications contained in the volume.

These cover a variety of topics including selection and breeding of cocoa; soils and nutritional factors; other environmental factors; experiments at River Estate; pests and diseases and the preparation and quality of cocoa.

Probably the most outstanding work recorded is that on the physiology of cocoa under the direction of Dr. H. Evans, whose advent to the college staff led to a great increase in research activity under this head. Of especial interest here is the work on micro-element deficiencies on which an excellent atlas is included which shows in a series of coloured plates the effects of deficiencies of a number of nutrient elements, both major and minor, on the appearance of cocoa foliage.

Other interesting matters are the investigations on the propagation of cocoa and the results of the cocoa breeding work and clonal trials carried out by Mr. Cope and his co-workers. Taken as a whole the volume is full of interesting matter and valuable material and is a noteworthy addition to the literature.

H.T.

Cacao, Cafe, Te

By Jaime Nosti Nava. Pp. 687. Illustrations 168. Salvat Editores, Madrid. 1953.

The ' Salvat Agricultural Collection ' of works in the Spanish language on a number of agricultural subjects has been enriched by this work on the world's most popular beverages. The author, a leading Spanish agronomist, has chosen the trinity, cocoa, coffee and tea as subject for a single volume because of the interrelation of at least two of them in a number of countries. This in spite of certain fundamental differences has already been emphasised by Wickizer in his recent book on the same subject: Coffee being grown in large plantations in a few countries and backed by a powerful semi-political organisation; tea being cultivated in large company-owned plantations with a large technical and scientific organisation; cocoa being raised by large numbers of small planters without adequate economic and technical reserves, but of comparatively great crisis-resistance power.

The author's treatment of the three subjects is somewhat cursory and this is reflected in the space devoted to each. The section on cocoa is presented in great detail and occupies over half of the book, whilst the story of tea is more concise, being confined to some 50 pages. In all three cases, however, the author presents a comprehensive survey of the plant and culture concerned. In doing so he follows a logical sequence, ranging over the history of cultivation; the climatic prerequisites; the anatomy, physiology and chemical composition of the plant; the methods of cultivation and collection; plant diseases; processing methods; classification and standardisation of the products; statistics of world production and trade.

The book, which has a number of useful tables, maps, illustrations and bibliographical notes, must be regarded as a valuable contribution to the knowledge of these three important tropical crops.

WORLD CROPS

IN OUR NEXT ISSUE there will be an article by Dr. R. O. Whyte on **Mediterranean Grassland and Fodder Research** while **Co-operative Grass Drying in Relation to Dairying in the United Kingdom** will be discussed by David Le Roi, B.Sc. Also in this issue will be an article describing recent developments in **Mexican Agriculture,** besides other articles.

Reports and Publications

The following Development Papers have been received from FAO:

No. 25. Interrelationship between Agrarian Reform and Agricultural Development

This is another in the valuable series of land tenure studies prepared by officers of FAO, and is from the pen of Mr. E. H. Jacoby. It is a thoughtful study of various aspects of this all-important subject and can be warmly praised for the straightforward and clear manner in which the essential problems are posed. It does not attempt to suggest any definite course of action, but in that it does clearly envisage most of the essential points it performs a valuable service.

No. 26. Equipment for the Processing of Long Vegetable Fibres

This is a useful bulletin of 53 pages which describes the various types of machinery for extracting various stem and leaf fibres including abaca, sisal, cantala, flax, hemp, jute, kenaf and ramie.

No. 27. Equipment for the Processing of Rice

This is a concise description and discussion of the machinery employed in rice processing. To those interested in the manufacture of rice it will no doubt prove an extremely valuable compilation.

Nos. 31 and 35. The Results of Co-Operative Hybrid Maize Tests in the European and Mediterranean Countries in 1950 and 1951

These are progress reports on the campaign being conducted by FAO, particularly in Southern Europe, to popularise hybrid strains of maize which have given such remarkable results in the U.S.A. It is obvious that the popularity of these hybrids is increasing as their value becomes known. In bulletin No. 35 a map is given showing the progress made in various parts of Europe which is definitely impressive, particularly in Spain, Italy, Southern France and Turkey.

No. 32. Small Farm Implements

This is an interesting publication which contains many illustrations of various types of implements used in different parts of the world.

No. 37. The Report of the Working Party on Fertilisers Convened by the International Rice Commission

This is a progress report on investigations on fertilisers in various rice growing countries. In regard to nitrogenous fertilisers, the best results have been given by sulphate of ammonia, ammonium nitrate is fairly effective while sodium nitrate is considered unsatisfactory. Liquid ammonia has been successfully used in the United States but difficulties of application make it impractical as a nitrogenous fertiliser for rice in Asia.

The Journal of the West African Institute for Oil Palm Research

We have received a copy of the first number of this new journal which, incidentally, marks the emergence of the Oil Palm Research Station into a West African Institute in its own right from its previous status of a purely Nigerian organisation.

Actually, the institute was founded before the last war, and was in its early years maintained with difficulty under wartime conditions. At the conclusion of the war its scope and work underwent enlargement and additional funds for its support became available; its present development marks the logical enlargement of its functions to include the whole of West Africa, in view of the increasing importance oil palms have of late assumed as a crop, coupled with the increasing recognition of the fact that, when they are efficiently cultivated, they are the most prolific producers of vegetable oil that the world has so far seen. Under its director, Mr. F. W. Toovey, the station has already accomplished a not inconsiderable volume of valuable work. At present its staffing programme is by no means complete, a result of the shortage of trained research workers.

The first number of the journal includes a number of interesting papers including an account of the institute itself from the pen of its director, from which we learn that the institute now comprises a main station at Beninand, a sub-station at Abak in Calabar province in Nigeria, a number of selection areas and five sub-stations on areas under the control of the Agricultural Department of Nigeria. The work of the station is organised in nine divisions. At the main station at Benin some 1,049 acres have already been established under experimental plantings of oil palms. The journal contains a number of valuable articles, notably an important and minutely documented article by Dr. J. M. Waterston on the incidence of oil palm diseases in Nigeria, and by Mr. Purvis on the controlled pollination of oil palms, a third by Mr. Toovey, the director, on field planting of oil palms and a fourth by Mr. Galt on the germination of oil palm seeds together with a series of shorter notes. The journal, which is printed in England, is profusely illustrated and well presented. We offer our best wishes to the institute and the journal for a prolonged career of usefulness.

H.T.

Southern Rhodesian Tobacco Crop

New records were established at last year's auction sales of Southern Rhodesia flue-cured tobacco which ended on September 29. In six months, 105,157,854 lb. were sold for £17,394,695. These figures are both higher than any previously achieved. Until last year the biggest weight ever sold in a season was 104,215,935 lb. (1950) and the largest sum realised was £17,235,725 (1952). But in other respects it was not a record crop. The average price of 39.70d. per lb. was more than 3d. below last year's record figure of 42.83d. The acreage planted was 14,000 below last year's record of 193,000 acres, and the average yield per acre, at 587 lb., was nearly 100 lb. lower than the record of 683 lb. established in 1950. Nevertheless, a relatively good crop was grown despite adverse weather—in particular, the overcast and drizzle that persisted for eight weeks when farmers needed sunshine to ripen their tobacco. The fact that 105,000,000 lb. were produced in such conditions suggests that, given reasonable weather, the 1953-54 crop will exceed the minimum target of 125,000,000 lb. set by the Rhodesia Tobacco Association. A crop of this size is needed if market demands are to be met. Purchases for the British market alone have been reduced by one-quarter through the short crops of the past three seasons. Many growers are hoping to beat the weather—and the pests that come with the onset of the rains—by planting earlier. The indications are that about one-third of all the tobacco planted will receive the fertiliser treatments recommended by the Tobacco Research Board, who are confident that this will result in a substantial increase in the yield per acre. Last year's Salisbury auction sales of North-Western Rhodesian flue-cured tobacco amounted to a total weight of 6,738,487 lb., sold at an average price of 34.92d. per lb., for £980,430. North-Eastern Rhodesian flue-cured tobacco sold on the floors totalled 3,584,444 lb. The total value was £408,766 and the average price was 27.37d. per lb. The Salisbury selling season for Southern Rhodesia fire-cured tobacco ended in July with a total weight sold of 367,877 lb. at an average price of 16.76d. per lb. The total value was £25,689.

FARM MACHINERY

Dorman Sprayer Demonstration

The Dorman Sprayer Co. Ltd. held a demonstration of its present range of models on November 18 at Teversham, near Cambridge. Eleven machines of the company's range were shown, including three entirely new sprayers, in addition to the modified 1954 models to its standard machines. The three new sprayers were:

(1) A 150-gal., saddle-tank, low/medium volume, tractor-mounted sprayer.

(2) A 40-gal., tractor-mounted, low-volume sprayer.

(3) A 150-gal., tractor-mounted sprayer for raspberry spraying and general duties.

The first two machines were later shown at the Smithfield Show and are described on page 25. The third sprayer has a wheel width of 2 ft. 9 in. for raspberry spraying, and a maximum of 4 ft. 3 in. for general crop spraying. Rate of application for raspberry spraying is 25 to 75 gal. per acre and for general duties 5 to 100 gal. The tank is specially treated for protection against corrosion. The machine is now being investigated for use in hops.

British Standard for Collapsible Wooden Broccoli Crates

Hitherto, broccoli growers and distributors of returnable broccoli crates have experienced inconvenience in the usé of collapsible containers owing to the lack of standardisation. One advantage of standardising the containers intended for packing perishable horticultural produce is that variations resulting from different designs are eliminated. Consequently, the lids and bottoms which are lost or unavoidably broken can be made good from any other stocks of collapsible containers which may be immediately available and can be obtained from other factors or manufacturers.

A standard crate has now been designed bearing in mind the need for economy, coupled with lightness in weight and ability to stand up to the hazards of handling, loading and transportation. No specific method of fixing lids has been stipulated and users may employ any suitable means, such as tensional steel strapping (flat band or wire), or twine or cord.

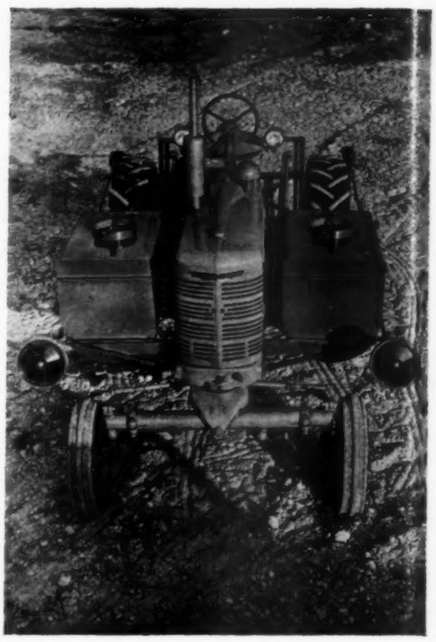
A British Standard (B.S.2034 : 1953) covering this crate has just been published and is the first of a series being prepared at the request of the Ministry of Agriculture and Fisheries for various kinds of containers for horticultural produce.

Fertiliser Distributor Demonstration

The 'Robot' mounted fertiliser distributor was demonstrated recently at a farm near St. Albans. The machine has a sowing width of 24 ft. and sowing rates of ½ cwt. to 15 cwt. per acre. It has two hoppers, holding from 10 cwt. to 14 cwt. of material. All granular and most powdered fertilisers can be dealt with.

The distributing mechanism consists of two reinforced, moulded-rubber conveyor belts, each driven by two pulleys rotating at the bottom of the fertiliser hoppers. The fertiliser escapes through a series of progressively inclined slots cut in the aluminium-plate sections. The makers of the distributor are Transplanters (Robot) Ltd.

The fertiliser distributor in action



The Dorman 150-gal. saddle-tank low/medium-volume sprayer, fitted on the Farmall 'M,' with booms closed in the travelling position

Portable Battery Searchlight

An extremely powerful portable searchlight suitable for a host of applications in agriculture is the latest addition to the range of alkaline battery lighting equipment produced by Nife Batteries. Fully approved by the Ministry of Fuel and Power, the new searchlight, designated the 'S6,' is said to possess immense mechanical strength and to throw a long, penetrating beam with wide angle diffusion.

A 6/8-volt, six-cell Nife nickel alkaline battery with a nominal capacity of 11 Ah powers a special clear-glass bulb with double bayonet contacts and twin filaments taking 3 and 0.5 amp. respectively. A full charge will provide three to four hours light on the main filament and about 20 hours on the reserve. Alternatively, a twin-filament 1.0/1.0-amp. bulb can be fitted which will permit nine to 10 hours' continuous burning. The recharging rate is 1.5 amp. for 12 hours. The bulb holder is fully adjustable to secure accurate focusing in conjunction with the parabolic silver-plated brass reflector. The 'S6' searchlight measures approximately 7½ in. by 5⅝ in. by 8½ in. and weighs 13 lb. complete.

WORLD CROP REPORTS

MEXICO

Wheat production. — The north-western state of Sonora is becoming Mexico's chief wheat supplier. Of the nation's crop of 670,000 metric tons last year, 275,000 tons were grown in Sonora —about 90% of the yield comprising hard red wheats with high protein content.

The National Association of Agricultural Producers reported that Sonora wheat averaged 8% to 10% humidity and a specific weight of 81 kilos per 100 litres. The state's crop this year represented a yield of 1,860 kilos per hectare, compared with 161,753 metric tons or 1,254 kilos per hectare in 1952. In the five years 1948-52, Mexico grew wheat sufficient to satisfy only 60.5% of national requirements.

PAKISTAN

Sugar.—The second forecast of the area under sugar-cane crop for the year 1953-54 is 864,000 acres, as against 733,000 acres reported in the second forecast of the previous year, thus showing an increase of 4.4%. The acreage reported in the final forecast of the previous year was 870,000 acres.

There has been a general increase in the acreage of this crop throughout Pakistan, which is attributed largely to the high prices of gur all over the country. In East Bengal, the increase is also partly due to favourable weather conditions at the time of planting and the release of jute land. Significant increases have occurred in East Bengal, North-West Frontier Province and the Punjab. The condition of the crop is normal.

MALAYA

Malaya's production of **palm oil** and **palm kernels** during the first six months of 1953 exceeded production in the same months of 1952 by about one-fourth. Palm kernel exports also increased from the preceding year, but palm oil exports declined slightly. Palm oil production amounted to 26,574 short tons, against 21,353 in the first half of 1952. The increase is attributed to an increase in harvested acreage, reflecting the gradual increase in planted acreage and better collections from acres harvested.

A major policy objective of the Malayan Government is crop diversification, and oil palms are considered one of the leading crops in this programme. Research has been undertaken on high-yielding varieties, and approved stock is being planted. Thus far, oil palms are confined almost exclusively to estate cultivation, and it does not seem likely that smallholders will become a significant factor in the foreseeable future.

Palm kernel production amounted to 6,899 tons in the first half of last year, compared with 5,553 in the comparable period in 1952.

While most of the locally produced palm oil is exported, there is a small local market in connection with the manufacture of soap and, to some extent, margarine. There is no significant consumption of palm kernels. Stocks of palm oil and palm kernels as of June 30 were reported at 7,222 and 1,617 tons, respectively.

ITALY

Crop prospects. The Statistics Bureau in Rome recently published the following crop estimates for 1953:

Maize, 3,100,000 tons, an increase of 29.8% on 1952 levels; rice, 841,200 tons (a decrease of 2.6%); sugar beet, 6,021,700 tons (an increase of 2%); olives, 1,700,000 tons (an increase of 66.9% on 1952 levels).

U.S.A.

Soya bean prospects.—Soya bean production prospects were sharply reduced by drought. October 1 indications point to a crop of 259,483,000 bushels, about 7% less than the September 1 forecast and 11% below the 292 million bushels produced in 1952. The current prospect is the lowest since 1949, but is still 18% above the 1942-51 average production. The U.S. average yield of 18.1 bushels per acre for 1953 is well below the 20.7 bushels of 1952 and the lowest since 1947.

Prolonged drought over much of the main soya bean area reduced yields from the previous month in most of the heavy soya-bean-producing states. Drought hastened maturity of the crop and beans are generally of small size; those combined to date have unusually low moisture content. A much larger proportion of the crop than usual was harvested by October 1.

In the north central states, prospects are lower in the major states, except Ohio, which held last month's yield, and Minnesota where the yield per acre was one-half bushel higher than on September 1. The crop in Indiana was about 50% combined by October 1 and indicated yields were down about a bushel per acre from September 1 largely as a result of smaller beans in the upper pods caused by heat and drought killing the plants prematurely. The yield in Illinois as indicated on October 1, at 21 bushels per acre, was down 2 bushels from the previous month. The crop in that state was about 85% combined by October 6. Beans were smaller than usual, moisture content was low, and there was considerable loss from shattering. Iowa, which suffered less from the drought, has an indicated yield of 22 bushels compared with 22.5 on September 1. The crop in that state was about 75% combined by October 5. The Missouri crop showed further deterioration during the month and indicated yields are not only low but a considerable acreage intended for beans has been diverted to hay and other purposes.

Prospects in the south Atlantic states have changed little from a month ago. A slight reduction in North Carolina was offset by improved yields in Maryland. The indicated production in other states in the area showed no change from September 1.

Prolonged drought over much of the soya bean area of the south central states resulted in a sharp deterioration of the crop during September. Indicated production in the area dropped from nearly 25 million bushels on September 1 to 19.3 million bushels estimated as of October 1. Substantially lower yields per acre than last month are reported in Kentucky, Tennessee, Mississippi and Arkansas, with a considerable acreage in some localities being abandoned and other acreage intended for beans being diverted to hay and other purposes.

FRANCE

Crop estimates. The area under grain in France in the 1953-54 season may exceed last year's levels, thanks to excellent weather conditions in October. The French Ministry of Agriculture, in its monthly crop report, said that sowing was well advanced and the shoots were in a satisfactory condition. The wheat acreage, the report added, would be between 5% and 10% higher in most regions, so that the total area might reach 4,300,000 hectares, compared with 4,176,800 hectares in 1953. The report also supplied new estimates on this season's grains crops as follows (all thousand quintals—first figures the 1953 crop, second figures 1952 crop): wheat, 88,452 (84,210); rye, 4,638 (4.815); barley, 33,684 (17,291); oats, 35,701 (33,548); maize, 7,842 (4,849); buckwheat, 956 (926).

Reports on the rice crop, however, were less favourable. Heavy rains in September delayed harvesting which took place in

difficult conditions because fields were frequently under water. On November 1, only one-quarter of the rice crop had been brought in.

The sugar-beet crop is expected to exceed 12,166,000 tons.

Output of oilseeds in France dropped sharply last year. The report gave the following indications for the 1953 oilseed crop (all thousand hectares—second figures for 1952): colza, 68.8 (129.8); poppyseed, 1.1 (1.4); rapeseed, 9.7 (12.2); sunflower, 3.2 (6.1).

The Ministry also reported that the 1953 hop crop had increased considerably, thanks to good weather conditions, while the area remained unchanged. Output was estimated at 22,200 quintals, against 17,500 quintals in 1952.

A good yield of hemp was expected, but because of a reduction in the planted area, it was expected that only 41,300 quintals of tow would be produced in 1953, compared with 53,700 quintals in 1952. For the same reason, flax output was believed to have declined to 356,200 quintals from 370,600 quintals in 1952.

CANADA

Grain. The Dominion Bureau of Statistics recently issued the third estimate of the principal grain crops in Canada as shown below:

Production (*All Canada*)	1953	*Thousands of bushels* 1953 Sept.	1952 Final	1951 Final
Wheat ..	614,000	594,300	*	552,657
Oats	405,600	404,900	466,805	488,191
Barley ..	262,000	273,000	291,379	245,218
Rye	28,100	29,300	24,557	17,647
Linseed ..	10,400	10,800	12,961	9,897
(*Prairie Provinces*)				
Wheat (Spring)	584,000	564,000	*	529,000
Oats	276,000	273,000	346,000	340,000
Barley ..	251,000	262,000	281,000	234,000

*Revised. The unrevised estimates were 687,922,000 for all Canada and 664,000,000 for the Prairie Provinces.

JAPAN

Rice Crop. Japan's 1953 rice harvest is estimated at 8,712,000 metric tons of brown rice in a crop condition report based on a mid-September survey. This is a downward revision of 560,000 metric tons of brown rice from the September 1 report and is 1,211,000 metric tons of brown rice less than the harvest of a year earlier.

The 1953 crop as reported in the October 1 estimate equals 23,888 million pounds of rough rice (16,722 million pounds milled) compared with 27,188.5 million pounds (19,032 million pounds milled) harvested in 1952. Rice production this season is the smallest since the wartime low of 1945. Adverse weather conditions were reported to be continuing.

A synthetic rice, composed of various combinations of wheat flour, potato starch, and natural rice in powdered form, has been developed in Japan. It is intended as an 'extender,' to be mixed with rice in cooking, and not to be eaten alone.

WORLD

Sugar. The first full estimates of world sugar production during the current season, with comparisons with the four previous campaigns, the 1939-40 crop and the pre-war year 1937-38 were recently published in *Czarnikow's Sugar Review* for November 5. Details are given hereunder of the total beet and cane crops over these years:

	Thousands of English Tons		
	Beet	*Cane*	*Total*
1953-54 Estimated	13,910	24,297	38,207
1952-53 Partly Estimated ..	12,343	23,370	35,713
1951-52	12,919	24,174	37,093
1950-51	13,083	22,249	35,332
1949-50	10,432	20,822	31,254
1939-40	11,455	18,344	29,799
1937-38	11,054	18,016	29,070

In most of the beet-producing countries the harvest was well under way at November 5, but lifting had by no means been completed and weather conditions have still to be reckoned with in the final assessment of sugar output. In the Western Hemisphere, a number of important cane producers do not open their campaign until the end of the year or the early days of the new year and estimates must, therefore, be somewhat tentative.

The estimated total world output of 38,207,000 tons is easily the highest figure ever reached, exceeding by more than one million tons the record established in 1951-52. This total is some 2½ million tons over last season's figure. Most of this is accounted for by the sharp rise in output indicated in Europe, the remaining increase being fairly evenly divided amongst other producers.

Although there has been steady expansion in many countries, the trend over the last three years has been mainly influenced by Cuba, her peak crop of over 7 million tons in 1952 making possible the record world total in the 1951-52 season.

Whilst the exceptional growing and harvesting weather in Europe has contributed nearly 1½ million tons to the current season's increase, the cane sugar estimate falls a long way short of the total which could be manufactured in the current season. The Cuban figure, for instance, is placed at no more than 5 million tons, whilst it is understood that a production up to her record 1952 figure is well within her capacity.

Flaxseed. World production of flaxseed in 1953 is forecast at 133.1 million bushels on the basis of early crop indications. This volume of output would be an increase of almost 1.5 million bushels, or 1% from the 1952 crop, revised downward to 131.7 million bushels. Moreover, it would be a harvest of approximately the average pre-war level, but about 4% above the average post-war level.

The outlook for a larger production of flaxseed is explained largely by the 26% increase expected in the United States and by the 12% increase in India. In contrast, Canada's production is expected to be down 17% and Argentina's may drop by roughly 20%.

Approximately three-fourths of the total production of flaxseed is grown in the free areas of the world, with roughly 60% of the total concentrated in the United States, India, Argentina and Canada.

Because of the sharp expansion foreseen in the United States, total North American flaxseed output is expected to be up 12%. Area indicated for harvest in 1953 in the United States is 1.1 million acres larger than in 1952. Hot, dry weather in August, however, reduced the yield prospects. According to September 1 indications, the crop will be 39 million bushels, against 31 million in 1952. Reduced acreages account primarily for the smaller outturn expected in Canada and Mexico.

On the basis of sketchy information, this year's flaxseed harvest in Europe is down possibly 500,000 bushels. This is attributed primarily to the sharp decline in Sweden's crop and the marked decline that probably occurred in the Netherlands.

Production in Asia should be up about 1.6 million bushels since India's crop increased by virtually that quantity. Final estimates place India's harvest at 14.2 million bushels against 12.6 million in 1952.

Forecasts of flaxseed production in Southern Hemisphere countries are as yet largely speculative, as the crop was not harvested until the end of the year. In Argentina, unofficial sources indicate that plantings were down 5 to 10% from 1952. Moreover, the crop reportedly is showing the effects of dry weather during the past two or three months. On the basis of this information and assuming an acreage abandonment roughly equal to the average of the past 10 years (about 22%), output may be around 18 million bushels. This would be about one-fifth less than the 1952 crop.

With this decline in Argentina and a drop of possibly 10% in Uruguay, total output in South America may be down around 18%.

Flaxseed production in Africa also may decline by about 10% on the basis of meagre information currently available from that area.